ENGINEERING AND MINING JOURNAL

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JUNE 1958

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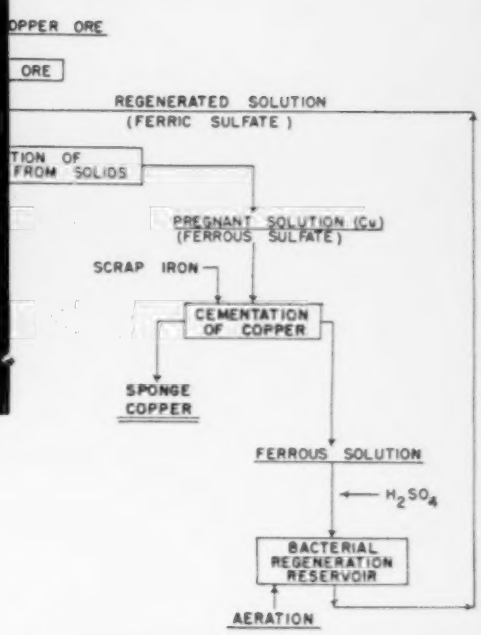

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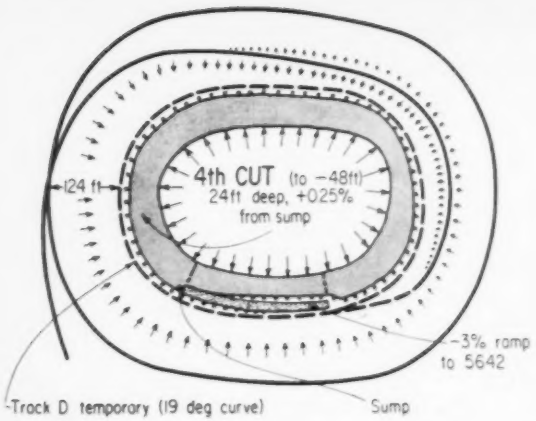

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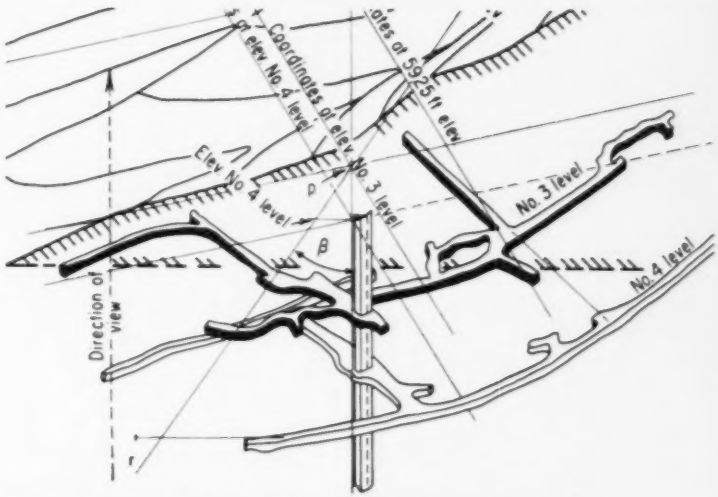
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Elev No 4 level
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Direction of view

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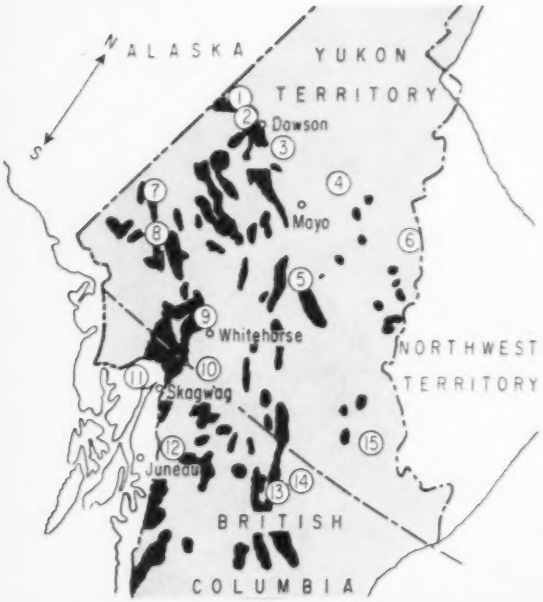

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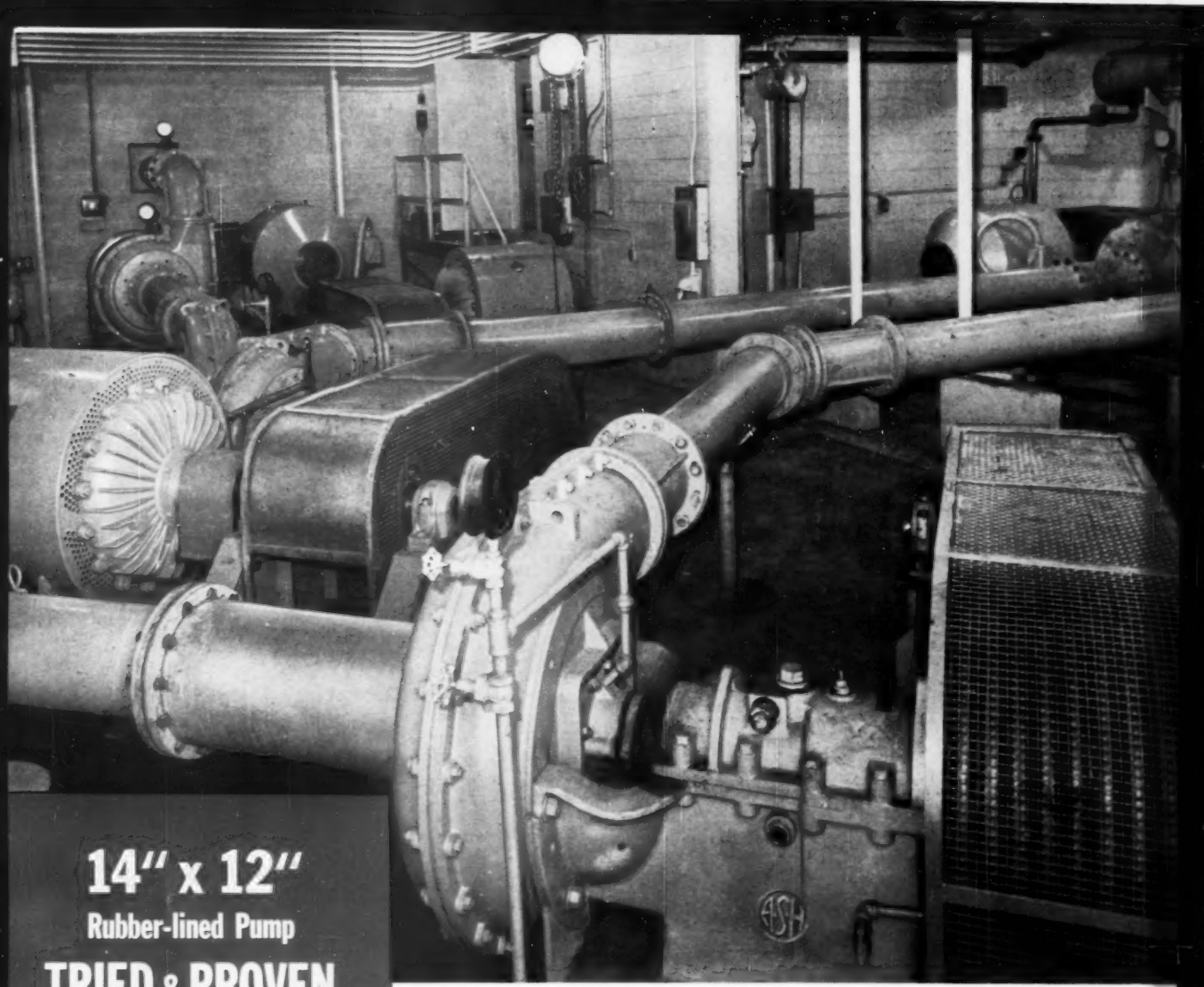

14" x 12"
Rubber-lined Pump
TRIED & PROVEN
at J & L Plant

Four 14" x 12" Hydroseal D-6-5 split-shell rubber-lined slurry pumps in the tailings booster station. Two in left background work together in series. Two in foreground each pump in series to old-style solid-shell Hydroseals.

For over a year newly-designed Hydroseal D-6-5 split-shell slurry pumps have been operating successfully in metallurgical plants throughout the country. Six of these world's largest replaceable rubber-lined pumps are in the ore-recovery plant of the New York Ore Division, Jones & Laughlin Steel Corp., at Star Lake, N. Y. Pumping right along with over 40 solid-shell Hydroseals, they have more than equalled the efficiency and cost-cutting records of their forerunners.

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MAXIMUM RUBBER PROTECTED

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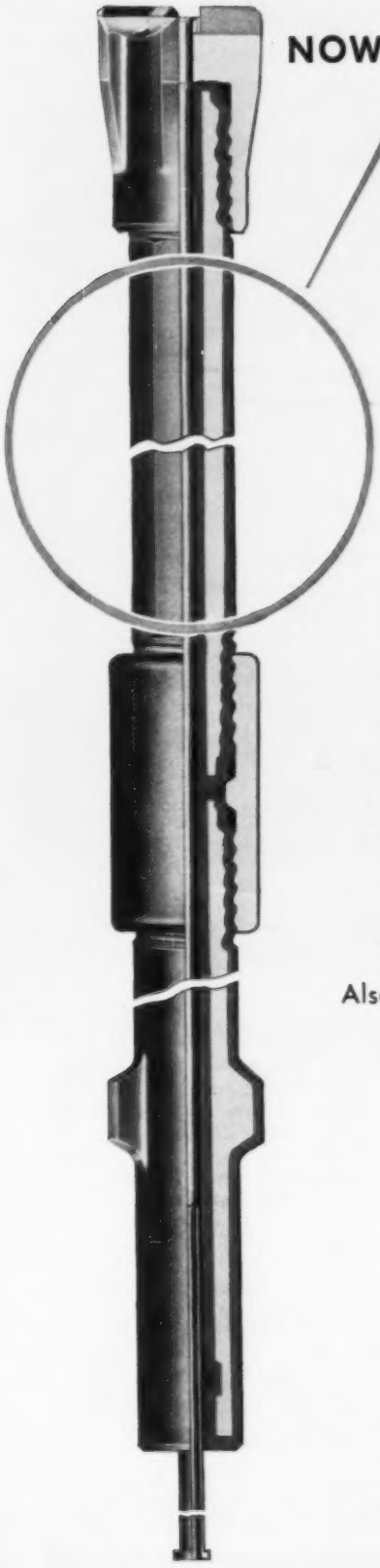

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		2⅛"	1	5
		2¼"	1	8
Type 22	1¼" O.D. Thread, 3 threads per inch	2"	1	2
		2⅛"	1	5
		2¼"	1	8

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ENGINEERING AND MINING JOURNAL

92nd YEAR OF PUBLICATION

JUNE 1958

VOL. 159 NO. 6

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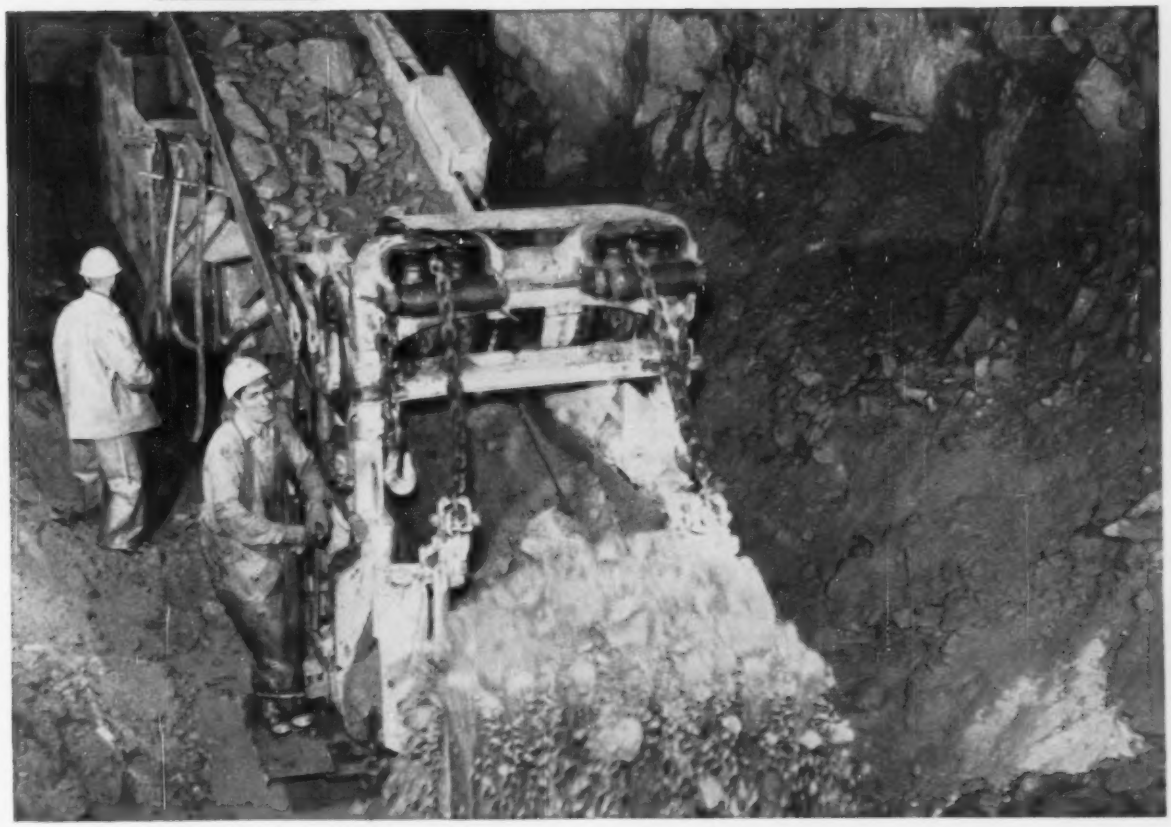

Punching a 3-mile hole through a granite mountain

B. F. Goodrich improvements in rubber brought extra savings

Problem: That picture was taken inside a mountain where men and machines are digging a tunnel for a power project. As fast as the sharp, jagged rocks—some of them boulders six feet wide—are blasted out, they're dumped on a conveyor belt and carried to mine cars. But the constant smash of heavy rock soon pounded the conveyor belt to death.

What was done: The project engineer chose a B.F.Goodrich Nyfil cord mucker belt to replace the ruined belt. This belt is designed to stand heavy impact. Nyfil fabric, made of chemically produced fiber, at the center of the belt gives it strength without extra weight. Cords running lengthwise at top and bottom of belt are surrounded by rubber. There are no cross threads binding them together, so they are free to give on impact, with rubber taking the shock.

For extra protection against impact, B.F.Goodrich used its patented *Transcord breaker*, an extra layer of parallel cords in rubber placed across the belt width and around the edges. It increases adhesion of cover to carcass by 50%, and prevents gouges and cuts from splitting the belt cover, keeps cover from tearing away from carcass of the belt under severe impact.

Savings: The B.F.Goodrich belt has lasted six months, is still going strong. While it cost nearly half again as much as the belt it replaced, the contractor says it's already paid off by giving twice the service, without costly shutdowns for repairs.

Where to buy: Your B.F.Goodrich distributor has full information on the conveyor belt described here. And, as a factory-trained specialist in rubber products, he can answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Company, Department M-329, Akron 18, Ohio.*

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Behind the By-Lines...

We sat with our two older fry a few weeks ago, watching Paul Muni's "Story of Louis Pasteur" on the Idiot Box and promptly found ourselves in a discussion of bacteria—beneficent and malevolent. We had almost given up in complete confusion a few days later when a patent came across the desk from Washington describing a process developed by Stuart R. Zimmerley, of Kennecott's Research Laboratory. Dr. Zimmerley and his intrepid band have developed a strain of bacteria which (who?) will leach copper. The story's on p 89.

What pleases us as much as Dr. Zimmerley's success is the great opportunity offered to him for a straight-faced delivery of one of the greatest bromides in our language. We can hear it now:

Bystander: "Hi, there, Doc. How's that new flowsheet of yours working out?"

Dr. Z.: "Pretty well, thanks. Of course, there're still a few bugs in it."

That interesting oval-shaped affair on the cover is not the original plan for the mezzanine floor of the Coliseum, although Francius Lloydius Wrightonius might take pardonable pride in its design. (Wrightonius was the original designer of the famous Roman structure but had his plans stolen during a pizza party in the Catacombs one Sunday evening. Little is known of the architect's later work, although he was given a commission to design The Lollobrigida, one of Italy's greatest contributions to the world of art.)

The drawing is actually one of six which appear in the article on dropcutting methods at Bingham Pit, starting on p 92.

Come to think of it, some future archeologist is going to have himself a real time trying to find the lions and tigers entrance in the vast shell outside of Salt Lake.

Add new recipes: It's been some time since we passed along a progress report in the culinary department. In fact, the last one was complete instructions for the preparation of Phil Simmons' famous charcoal steak with Moenkope Dust Sauce.

The latest contribution, domestic fowl division, comes from McGraw-Hill's editorial director, Ralph B. Smith, who discovered it in his early youth while working in a southern hotel. It follows:

"While consorting with the kitchen staff one day, I watched the kitchen kings, the chefs, preparing a turkey for their own Sunday dinner. They did it by feeding the bird brandy. When dispatched, he was in a completely relaxed condition. The chefs told me that, having died with relaxed tendons, he could be eaten with a minimum of toothwork." Mr. Smith suggests the name "Turkey a la Hennessey." We've promised to pass the word along to Betty Crocker.

We are indebted to the Rio Tinto *Recorder* for the following item, supposedly the reaction of an Ontario Indian sachem to the activities of uranium miners in his native territory:

"Two or three hundred years ago, the white men first came to the North Shore. They took all the furs and gave the Indians some beads. Some years later the white men built saw mills at Cutler, Spragge, Spanish and Blind River. Then they cut down all the big trees in the forest.

"The mills burned down and the white men went away. Then they came back and built a paper mill and cut down all the small trees. There wasn't much left on the North Shore but rock.

"And, now, by gosh, they've come back for the rock!"

In our several trips north of the border we have been impressed frequently, and often painfully, by the talent displayed by our Canadian friends at the poker table. In fact we're still feeling slightly mauled after a session with a Dr. Jekyll from Yellowknife who turned Hyde at the sight of green felt.

That talent, though, was clear in the mood of the members of the Canadian Institute of Mining and Metallurgy at CIMM's Diamond Jubilee meeting in Vancouver. The boys have a good hand and they know it. Canada's mineral picture could look better, as could nearly every segment of our industry. But CIMM knows the potential of the mineral north as well as its individual members know the value of aces and tens back to back.

R. Clayton Jones, correspondent for *E&MJ* at Vancouver, did a lot of looking and listening at the Diamond Jubilee meeting. The story starts on p 82, with pictures, maps and flowsheets. Since Our Mr. Jones came away with the impression of optimism, we gather his fellow Canadians weren't able to entice him into an educational session of five-card stud.

Another mining area that refuses to be intimidated by current metal prices is in Arizona's Pima District. True, local activity has slowed, but when *E&MJ* stopped by last month there was no sign that the exploration, development and design departments of the various copper mines see anything but a bright future. The roundup, with on-the-spot pictures, starts on p 102.

And then there's the story of the Dutch Boy at the Dike. When he got home, his mother said, "How did it go today, son?" "Gee, Mom," he said "I had a real tough day at the orifice."

"BIGGEST" OPEN PIT OPERATION IS HANDLED BY CAT MACHINES

Cat DW21 (Series C) Tractor with Athey PR21 Wagon removing overburden in an open pit copper mine in Northern Rhodesia. Their speed and power make them fast, dependable producers.

With a spread that includes 26 of all types of Cat machines—working the largest open pit copper mining operation in Africa—a mining company in Northern Rhodesia is excavating 600,000 tons of earth and ore per month.

This owner has purchased Caterpillar machines because of their ability to keep going 23 hours a day (one hour required for servicing)—with a minimum of down time. A matched fleet of Cat DW20 (Series E) and DW21 (Series C) Tractors with Athey Trailers spearheads the job, and has the speed, guts and capacity that add up to a low cost-per-cu.-yd. figure.

Cat wheel-type Tractors have always had the rimpulls and fast-cycle potential to enable owners anywhere to meet production dates at an operating profit. Now new DW21 (Series D) and DW20 (Series F) Tractors are available. They feature the new Cat Super-Turbo Engine—that produces 320 HP (maximum output) and 28% torque rise!

Athey Trailers feature low center of gravity and plenty of ground clearance for excellent roadability. And both the Caterpillar and Athey units have the built-in dependability to get the job done without costly lay-ups for major overhaul.

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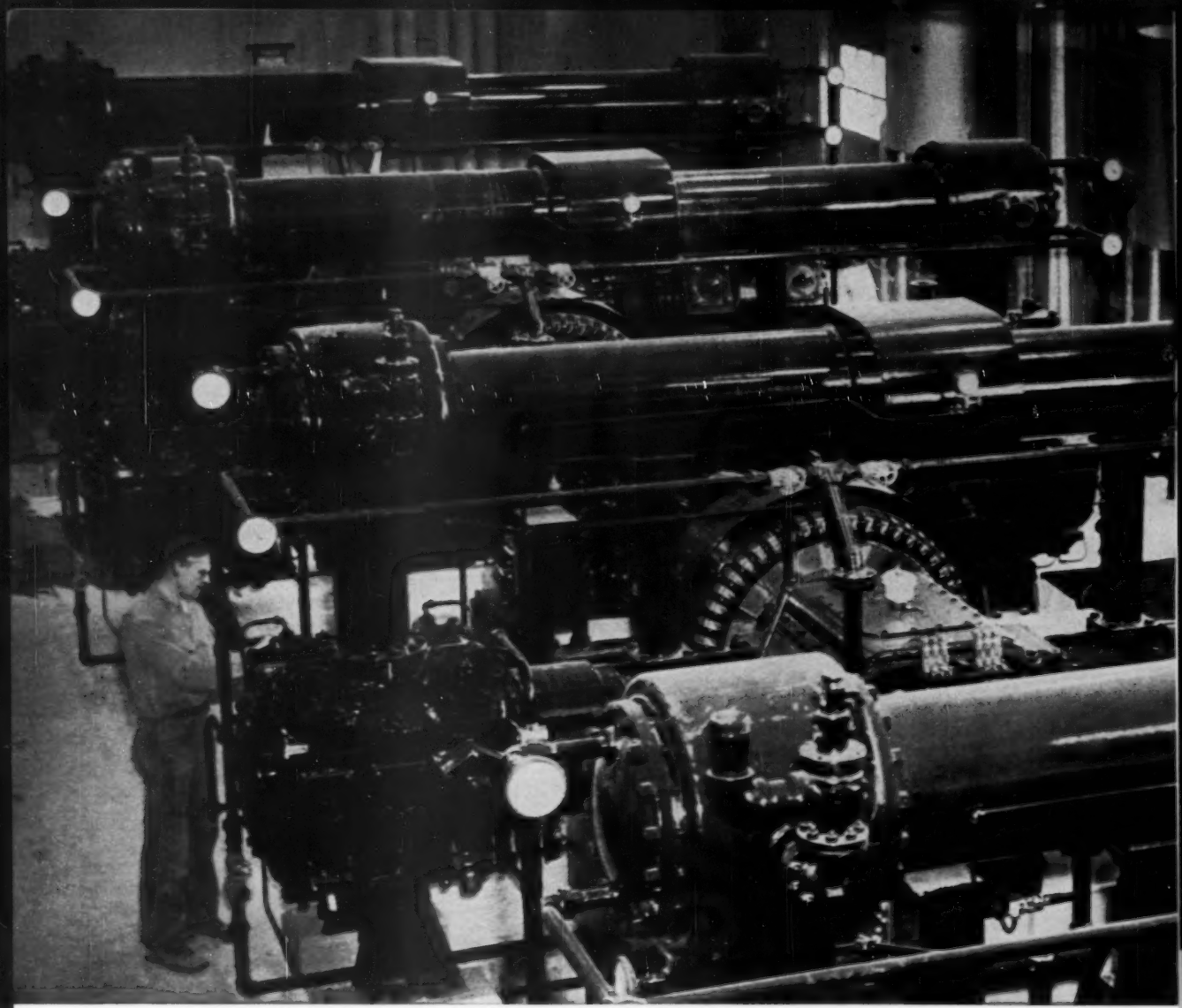

DON'T USE MORE OIL THAN YOU NEED TO

When an air compressor operator sees signs of wear, he often adds more oil and soon finds that over-lubrication is just as damaging. It causes excessive carbonization.

The answer to wear is not more oil but the *right* oil, Texaco Regal Oil R&O. First, it's a superior lubricant, second, its additives protect compressor systems against rust and oxidation, and keep systems clean, free from harmful deposits, assure top performance.

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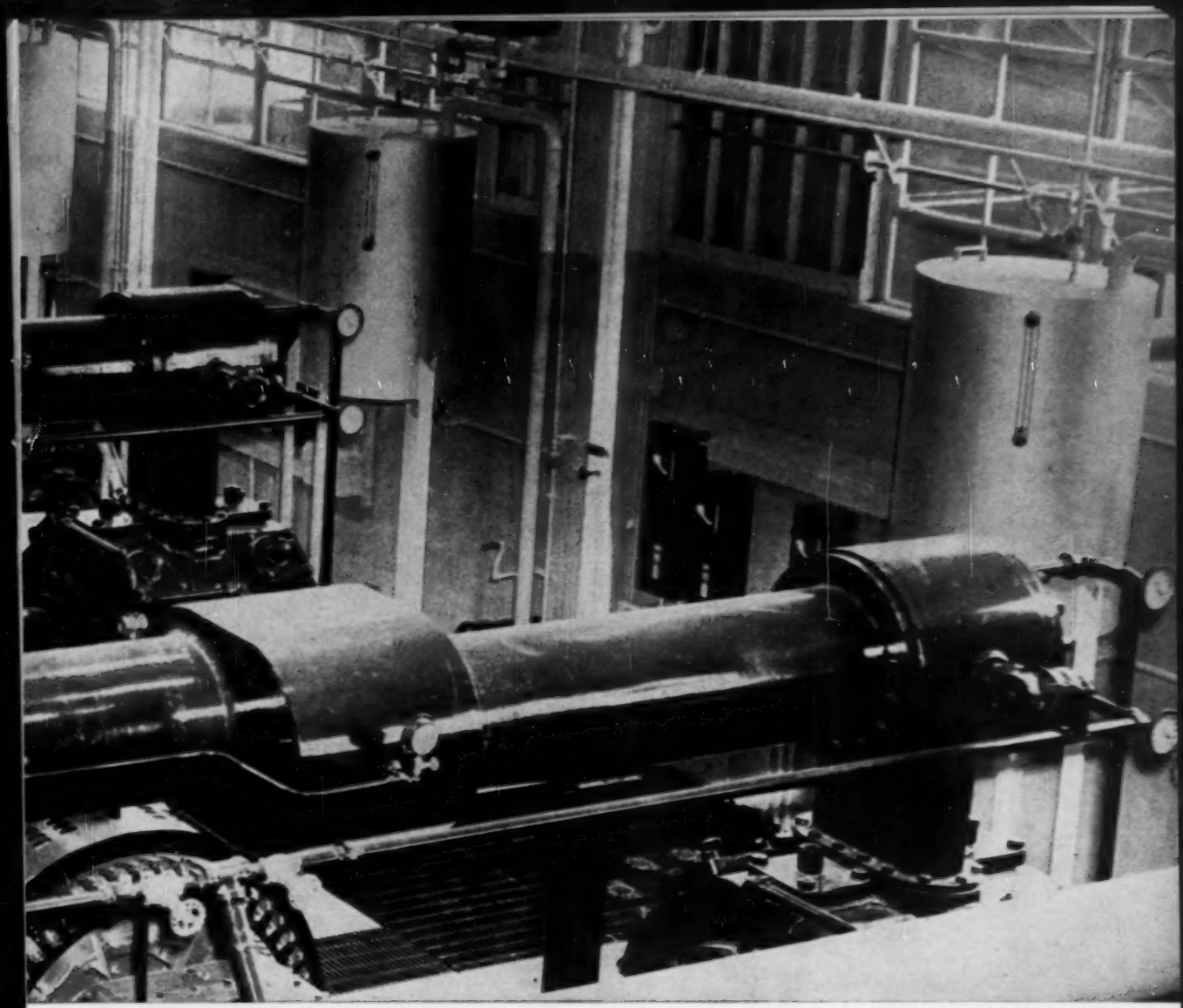

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HELP FOR YOUR PROBLEM: If there's a step in your process where intimate contact between solids and gases is required, fluidization should be investigated. Dorr-Oliver will be glad to work with your research and development men, run pilot plant tests at our laboratories, or cooperate in any other way to insure a realistic evaluation in terms of your particular needs.

Dorrco FluoSolids system produces cobalt, SO_2, and Fe calcine in a single roasting operation!

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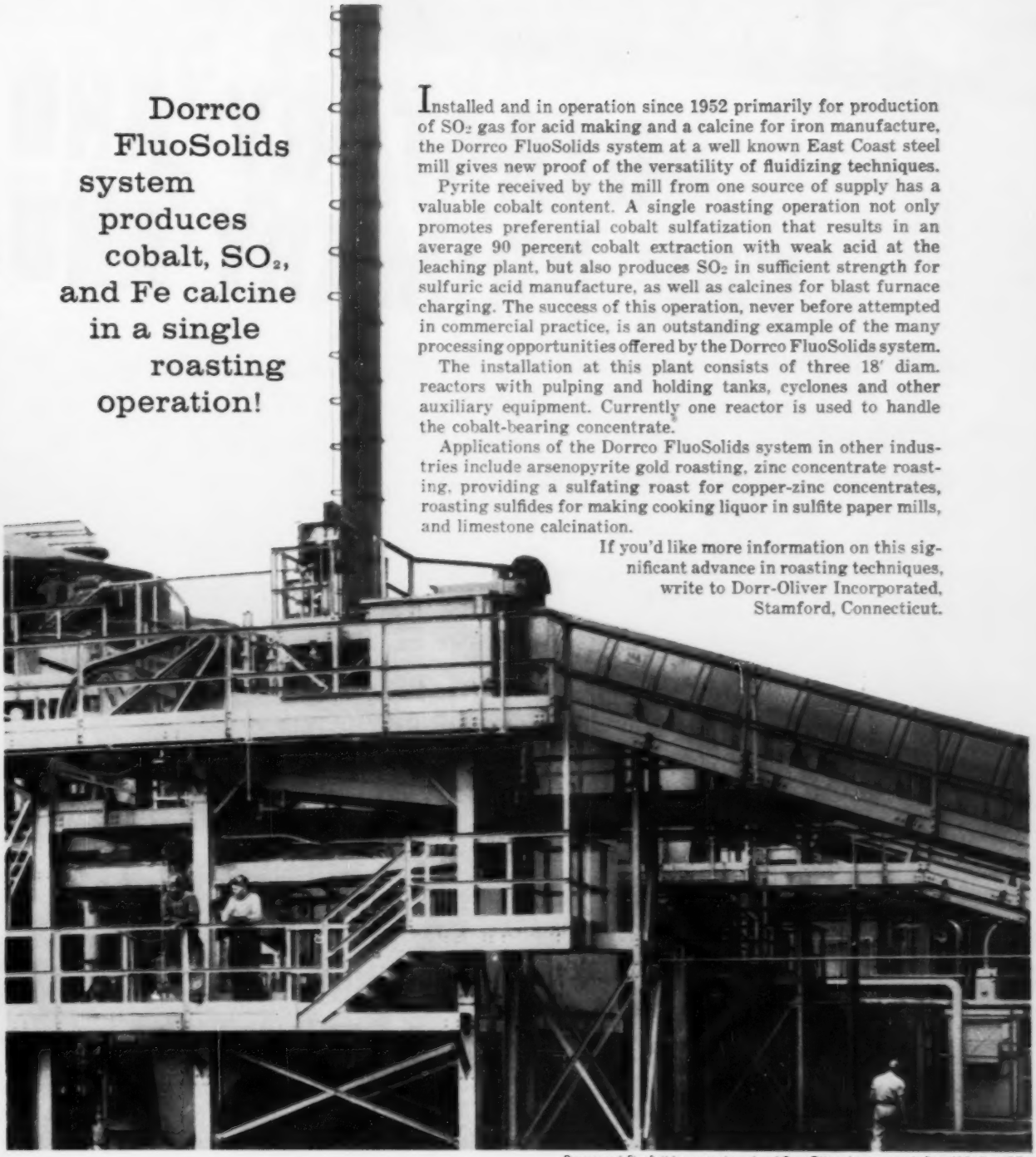
The installation at this plant consists of three 18′ diam. reactors with pulping and holding tanks, cyclones and other auxiliary equipment. Currently one reactor is used to handle the cobalt-bearing concentrate.

Applications of the Dorrco FluoSolids system in other industries include arsenopyrite gold roasting, zinc concentrate roasting, providing a sulfating roast for copper-zinc concentrates, roasting sulfides for making cooking liquor in sulfite paper mills, and limestone calcination.

If you'd like more information on this significant advance in roasting techniques, write to Dorr-Oliver Incorporated, Stamford, Connecticut.



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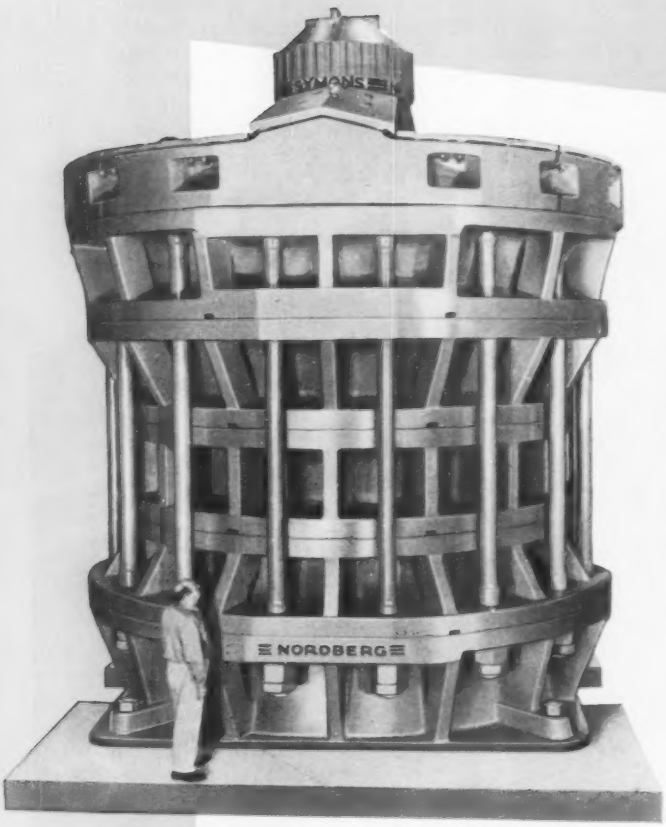

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SYMONS 42" GYRATORY CRUSHER

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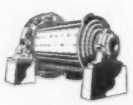

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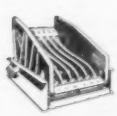

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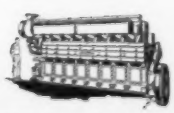

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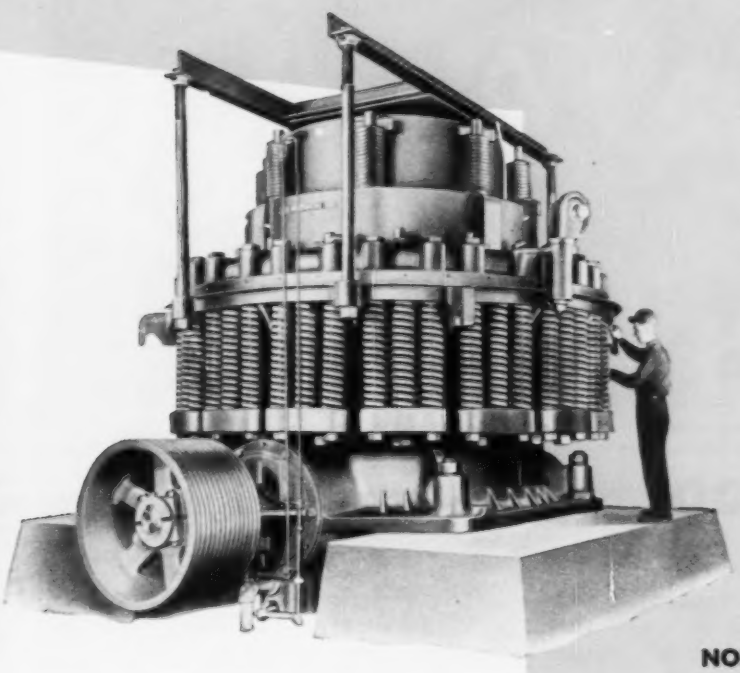

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Putting down hole with Bethlehem Hollow at sandstone property of Sullivan Highway Products Corp., Kenoza Lake, N. Y. Drill steel reconditioner: Howells Mining Drill Corp., Plymouth, Pa.

Daily production: 1200 tons of crushed stone

Here you see Bethlehem Hollow Drill Steel, 1¾ in. round, biting into medium-hard, abrasive sandstone in the quarry of Sullivan Highway Products Corp., Kenoza Lake, N. Y. The 2¼ in. blast holes, on 6-ft centers, average 24 ft in depth. Quarried at the rate of 1200 tons daily, the Specification Crushed Stone is for general highway use.

Bethlehem Hollow Drill Steel is just the ticket for rock drillers because it is rolled from fatigue-resistant steel, and has a uniform hole which is centrally located in the bar. The steel has a wide quenching range, and is easy to heat-treat for the proper balance of toughness and wear-resistance, making possible long-wearing threads and strong shanks.

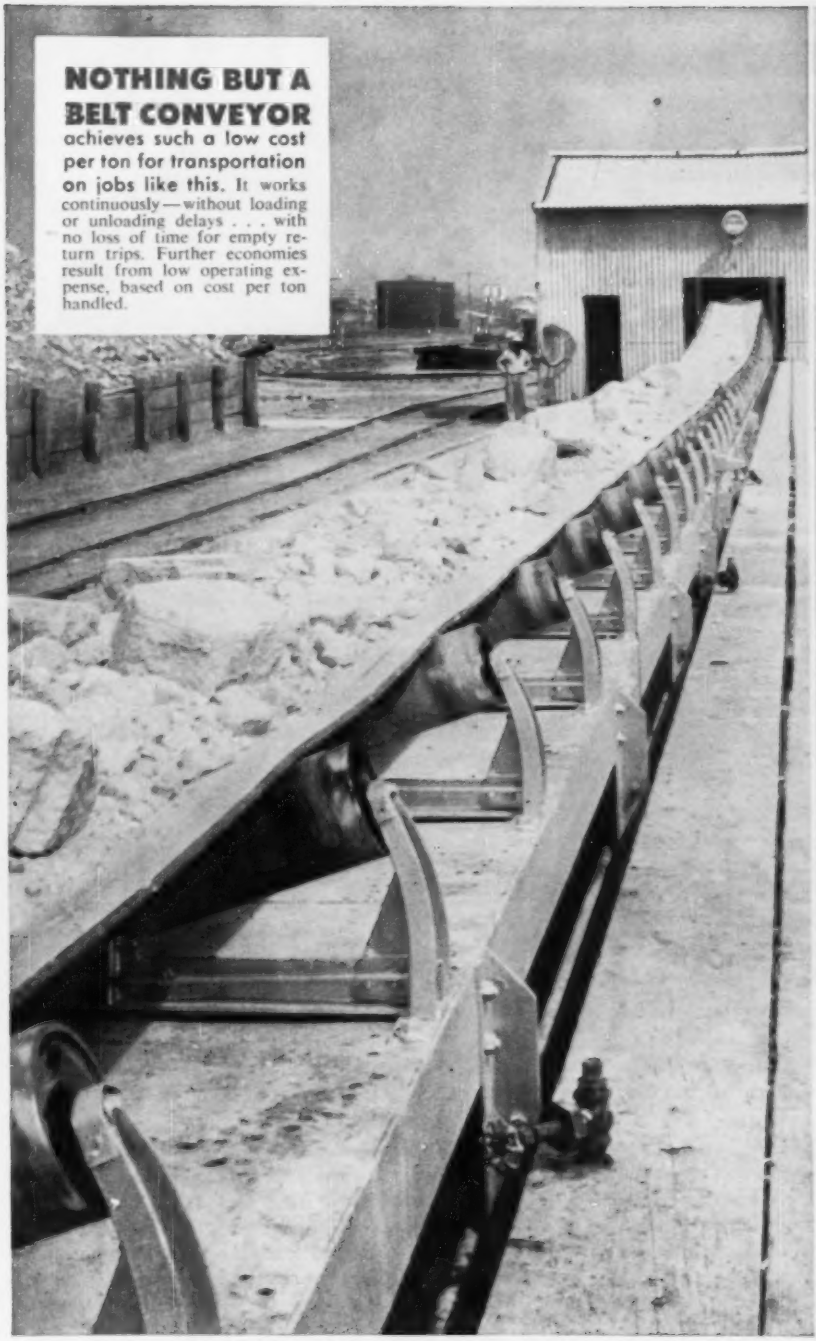
Bethlehem Hollow is made in Carbon and Ultra-Alloy grades in rounds, hexagons, and quarter octagons. It is furnished in lengths of from 18 ft to 27 ft. Longer lengths can also be supplied to meet special needs. Put it to work on your next rock drilling project.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation.

BETHLEHEM HOLLOW DRILL STEEL CARBON AND ULTRA-ALLOY

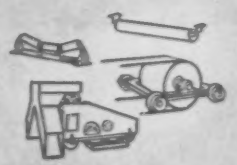
BETHLEHEM STEEL



NOTHING BUT A BELT CONVEYOR achieves such a low cost per ton for transportation on jobs like this. It works continuously—without loading or unloading delays . . . with no loss of time for empty return trips. Further economies result from low operating expense, based on cost per ton handled.

. . . AND NO ONE BUT LINK-BELT offers such complete service for engineering belt conveyors. Calling on unequalled depth of experience, Link-Belt can do a quick but thorough job of analyzing your requirements . . . back up recommendations with a complete line of equipment.

OVERALL ENGINEERING



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SKILLED ERECTION

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No wasting of engineering manhours on details . . . no need to exchange drawings with scattered suppliers with Link-Belt handling your belt conveyor installation. You get all equipment from one source . . . the specialization that only industry's most comprehensive line of idlers—plus pulleys, drives, terminal machinery and auxiliary equipment—can offer. From design through erection, Link-Belt takes on total responsibility. Our nearest office has full information.

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BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

OFF THE SHELF–

NO REBORING–

NO KEYSEATING–

NO WAITING!

TAPER-LOCK SPROCKETS
SINGLE AND DOUBLE STRAND!

NOW Taper-Lock *Double* Strand Sprockets are available—from stock—ready for the shaft without re-machining!

They offer all the advantages of Taper-Lock mounting. Easy on! Easy off! Precision machined at the factory, they come to you with accurate, concentric bores —insuring full contact between hub and shaft. Taper-Lock grips with the firmness of a shrunk-on fit!

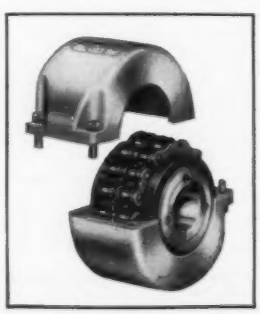
There is no flange, no collar, no protruding part. Flush design means *safety*... If the sprocket becomes worn, you replace only the tooth part. The bushing is used again and again. And Taper-Lock bushings are interchangeable in Dodge Taper-Lock Sheaves, Couplings and Conveyor Pulleys!

Taper-Lock Sprockets and Dodge Roller Chain (made to ASA standards) are stocked by Dodge distributors. Single Strand sizes range from No. 40 to No. 160, up to 112 teeth; Double Strand from No. 40-2 to 80-2, up to 102 teeth. Write for Bulletin A-644 containing selection, installation and maintenance data.

DODGE MANUFACTURING CORPORATION
3100 Union Street, Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

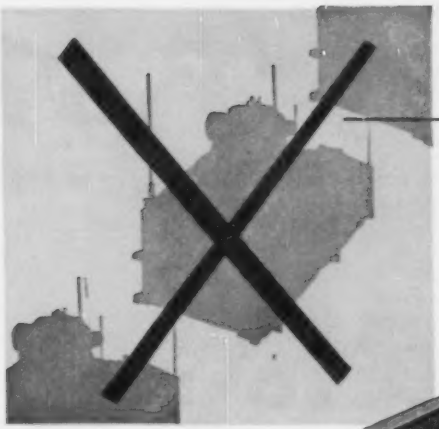
CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

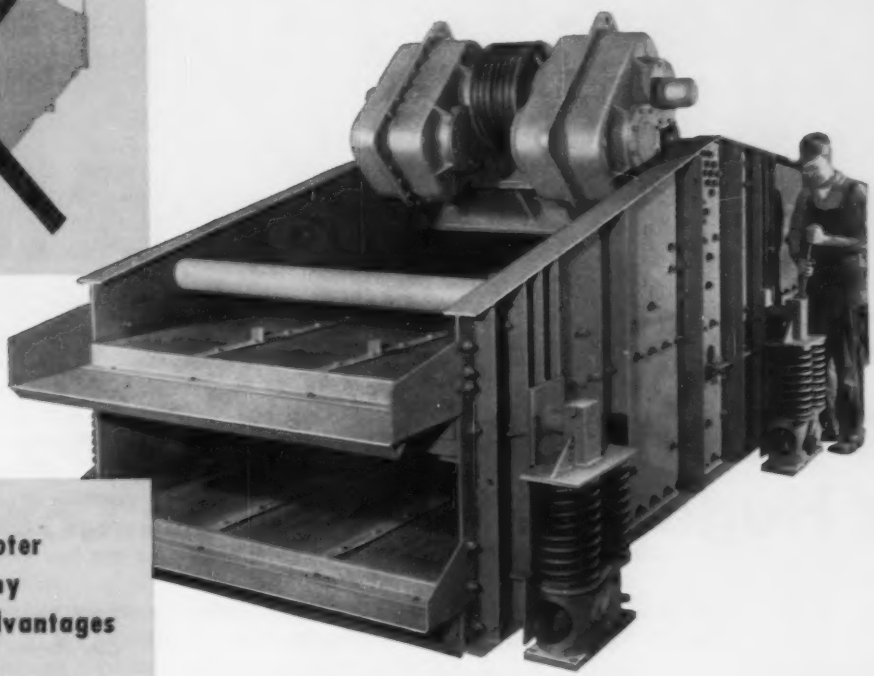


TAPER-LOCK CHAIN COUPLING

Accommodates common minor shaft misalignments. Provides strong, compact coupling. Available with covers, for appearance, safety, dirt protection and lubrication — which increases coupling life.

NOW one BIG SCREEN does the work of multiple units





Husky 20-footer offers many profit-building advantages

Volume — This single, high tonnage *Low-Head* vibrating screen is a unit that out-produces a series of two or more screens in coal, metal mining and rock products fields.

Multiple operations on one screen — Operations in sequence, such as draining, washing and dewatering, are accomplished on one big Allis-Chalmers screen.

Cut Cost... Save Space

Obviously, in the application of a single unit, installation cost is considerably less than that of multiple units. Feeding arrangements are simpler. Collecting hoppers and chutes are easier to install. Maintenance costs are proportionately lower. And, of course, a single big unit takes up less space than a multiple unit installation.

For complete information, see your Allis-Chalmers representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. Ask for Bulletin 07M7500-111.

Low-Head is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5485

50-Rs Speed Mountain Top Removal At Huge Latin American Copper Mine

Fast-drilling Bucyrus-Erie rotary drills were put to use recently as Southern Peru Copper Corporation began blasting operations at its new mine located 100 miles inland from the Pacific port town of Ilo.

Before any ore can be mined, the company must remove the top from a mountain called Toquepala. Excavation amounts to some 120 million tons of rock and earth.

To get things going, seven 50-Rs were brought in for drilling blast holes. They are well equipped for the job. *Variable drilling speed* and *variable pulldown pressure* provide the resources for speedy drilling at Toquepala.

Ward Leonard variable voltage control gives the operator smooth, instant command over rotation of the drill pipe. He can choose the most efficient speed for a given formation without stopping the drilling operation. Hydraulically powered down pressure on the bit provides controlled load on drilling tools for maximum penetration.

These seven 50-Rs are electric rigs designed for drilling 9⅞ to 12¼-in. holes. For drilling 6¾ to 9-in. holes Bucyrus-Erie Company offers the 40-R with either diesel-electric or full electric power.

Get the full story on these drills today. Write direct for illustrated literature. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

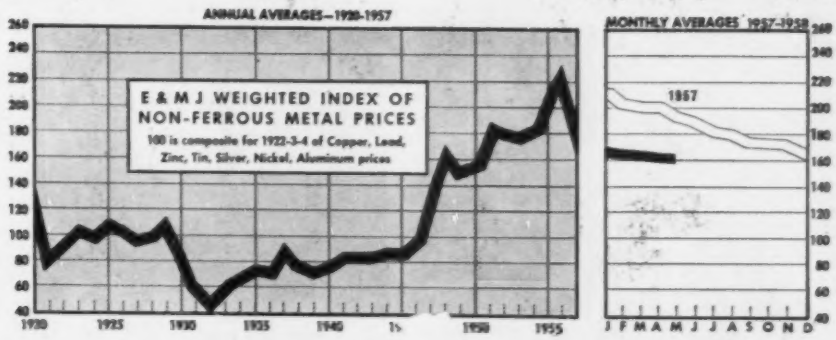
74B58C

A Familiar Sign . . . BUCYRUS-ERIE *. . . at Scenes of Progress*

THIS MONTH IN MINING

E&MJ OUTLOOK

PRICES



MARKETS

A drop in lead prices accounted for the slight decline of E&MJ's metal price index from 165.0 for April to 164.6 for May. This may be the leveling off of the steady decline in metals prices which set in about mid-1956. Market observers view the slight increase in custom smelter prices for copper during May as a hopeful sign for improvement in copper markets.

If you are keeping track of the general course of industry and the metals business on the graph which appeared on p 109 of the February issue of *E&MJ*, plot these points for May: E&MJ metals price index 164.6; estimated Federal Reserve Board index of industrial production, 126; and E&MJ index of metals use, 159.

●

AT HOME

Alcoa aims to capture some of the substantial market for copper magnet wire by assisting manufacturers of electrical windings to incorporate aluminum foil and sheet strip into their products. Alcoa has purchased the transformer division of Automation Instruments, Inc., Boulder, Colo., to carry out this development program.

Anorthosite may some day be smelted to produce aluminum, according to Walter L. Rice, vice president of Reynolds Metals Co. Development of low-cost atomic power and new metallurgical processes will be required to make this possibility a reality.

Uranium producers at the recent meeting of the Uranium Institute at Albuquerque, N. M., successfully expressed confidence that they will be able to compete with foreign producers in world uranium markets.

●

LABOR

Officials of the International Union of Mine Mill and Smelter Workers indicate that they would prefer tariffs rather than the Seaton Plan as an aid to domestic mining. IUMM&SW put on a six-week TV campaign in Utah and Nevada criticizing American producers for keeping Chilean mines operating at full capacity while curtailing domestic production.

●

ABROAD

Nickel powder can now be compacted and rolled into strips possessing excellent mechanical properties by a new process developed by Dr. J. A. Lund, of the University of British Columbia, for Sherritt Gordon Mines, Ltd.

Philex Mining Corp. will have its 2,000-ton mill at Santo Tomas, P.I., operating at full capacity producing gold and copper by the end of this month.

Despite low copper prices, copper producers in South Africa, Southern Rhodesia and Northern Rhodesia are going ahead full speed with large-scale production programs. The same applies to the Southern Peru Copper project.

France plans to increase aluminum production by 70% within the next two years, from 159,000 tons in 1957 to 275,000 tons by 1960. Output of 365,000 metric tons is forecasted for 1966.

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WASHINGTON IMPACT

Highlights

SENATE SCENE—The Greatest Deliberative Body in the World is a title which oratorical Senators delight in attaching to the upper chamber. Its debate on foreign trade and domestic commodity policies this month—in committee and on the floor—will go far toward strengthening this euphemistic claim.

The fight over extending the Reciprocal Trade Agreements Act will run longer and hotter than in the House. It will be considerably broader, also, embracing the equally controversial issues raised by Interior Secretary Fred A. Seaton's minerals support program, sent to the Senate in bill form late last month (see story this page).

More important, the two political footballs of trade and commodity aid are tied together, and where each winds up depends significantly on where the other is booted. The main separation between the two will come only when some sort of trade legislation is passed—the mineral subsidy scheme is not likely to reach that final goal this session.

STRATEGY—Here's how the trade-commodity scrap shapes up. Domestic metal-mineral producers fall generally into one of two loosely bound groups of objectors to the trade bill hammered out by the House Ways & Means Committee. Together with independent petroleum producers and textile mills, they see import restrictions as the best possible insurance against the current world-wide market slump. Through their Senators, therefore, they will fight hardest for specific commodity protection in the trade laws, including provisions for higher tariffs or quotas, or both.

The other broad category of protectionist opposition to reciprocal trade is made up of diverse producers of chemicals and a gamut of items such as fish products, plywood, watches and many others. They are concerned primarily with procedural restrictions on trade agreement powers—shifting this authority from the President back to Congress and making it easier to win import relief through escape clause and national security provisions.

Debate on the trade extension bill in the House centered largely around the second group's demands. The concessions that were made were aimed at them. They did not get anywhere near the restrictions they wanted, but they got more than proponents of specific commodity quotas.

On the other hand, commodity protectionists have a slim alternative hope to import quotas. In the case of nonferrous metals and minerals, the Administration is trying to hold out this alternative in the form of Seaton's subsidy plan.

Mining-state Senators, therefore, will try to use domestic mining aid as a lever. The Seaton plan doesn't satisfy in its present form, but the Senate Interior Committee will try to make the most of its possibilities before mounting an all-out attack on the trade bill, in view of the Administration's firm stand against import quotas written into law.

Chairman James E. Murray (D-Mont.), commenting on the Seaton legislation, dropped a significant hint of what he plans to do. He refused to say anything about the subsidy proposal, "while the committee is seriously considering what form a domestic minerals purchase program should take." In other words, his group will try to revise the Interior Department's plan back to the more familiar incentive purchase or stockpile program—at least for copper, lead and zinc—at the same time keeping the subsidy approach for some of the other commodities.

Should Murray succeed, Western Senators will limit their attack on the trade bill to a push for higher tariffs, drop the quota demands.

If Murray fails—and he's up against tough opposition from budget-minded legislators who would oppose the appropriations for a purchase program revival—mining interest would again drive for quotas.

Other protectionists, meanwhile, will continue their fight for further procedural restrictions to the trade laws.

The upshot is that neither the trade nor commodity problems will be finally settled this year, even with passage of a compromise trade act. Whatever trade bill is passed, it won't satisfy either group of protectionists. And chances for any kind of broad domestic mineral support legislation this year are slim.

Seaton Defines Plan For Mineral Support

SUBSIDY SUPPORT for domestic metal-mineral industries was spelled out in detail late last month when Interior Secretary Fred A. Seaton sent his department's specific proposals to the Senate Interior Committee in bill form. The details do little to overcome initial mining opposition to the plan (see highlights this page).

The stabilization plan calls for quarterly production quotas and floors under subsidy payments set out in Seaton's original outline (*E&MJ*—May 1958, p 19). The price differential which the Government would pay domestic producers varies for the metals and minerals included in the plan. Here's the schedule:

Commodity	Support price	Floor price
Copper	27½c per lb	24c
Lead	14¾c per lb	11.375c
Zinc	12¾c per lb	10¼c
Fluorspar (acid-grade)	$48 per st	$40
Tungsten	$36 per stu	$18

Commodity	Total annual production quota	Individual quarterly production quota
Copper	1-million tons	2,500 tons
Lead	350,000 tons	1,250 tons
Zinc	550,000 tons	1,250 tons
Fluorspar (acid-grade)	180,000 tons	1,250 tons
Tungsten	375,000 tons	3,000 tons

The quarterly quotas, of course, don't equal annual figures when multiplied by four. They would be guide rules for Government payments to individual producers and no subsidy payments would be made to producers who exceed them for two successive quarters by the following amounts: copper, 30,000 tons; lead, 9,000 tons; zinc, 15,000 tons; fluorspar, 5,000 tons; tungsten, 55,000 short ton units.

This means that any producer would receive the difference between his sales price and the support price, provided he didn't sell below the floor price, and within the quota limitations. Sales to the Government under existing stockpile or incentive purchase programs would not be included in the subsidy reckoning. In addition, tungsten subsidies would be limited to 15,000 tons in "any one mining district."

Further specific details of allocation of the payments remain to be worked out under departmental regulations.

Late Developments

BARTER RESTRICTIONS, levied by the Agriculture Department last year, will be reviewed by the House Agriculture Committee, as part of its consideration of legislation to extend the domestic crop surplus disposal law (P.L. 480). A move to force the department to liberalize its restrictive rules on importers was de-

feated in the Senate, but metal traders hope to win House backing for two important changes.

One would kill the so-called "additionality requirement"—the provision that traders must show that crops bartered for foreign metals and minerals are in addition to regular commercial sales and are not displacing them. The other amendment would remove the ban on domestically processed foreign ores, which limits the amount of ferroalloys that may be received in barter exchange. House Agriculture Committee critics of the restrictive regulations say they helped force domestic lead and zinc into the position of needing additional Governmental support.

NEW IMPORT RESTRICTIONS on a broad range of products may result from Congressional approval of technical amendments to the 1921 anti-dumping law. The Senate this month will consider approving changes already passed by the House and okayed by the Senate Finance Committee with Administration backing.

Key changes would permit and require higher anti-dumping duties on any item found being imported at less than "fair value" by (1) changing the basis for comparing foreign and domestic prices, and (2) loosening the definition of comparable foreign and domestic classes of goods. The changes are likely to go through.

ASBESTOS AND FLUORSPAR purchase programs have been extended for another year. Senate and House have agreed on a one-year extension as part of the Interior Department's annual fiscal budget.

SALE OF SOME LOW GRADE MANGANESE ore from General Services Administration stockpile has been announced. Disposal of approximately 300,000 long tons from GSA's El Paso depot, however, does not indicate the wide-scale Government disposal of stockpile surpluses which requires Congressional approval. GSA and Office of Defense Mobilization officials have denied recently before Congressional committees that such is their intention. The manganese ore in question was Mexican ore being held in "inventory" rather than in the stockpile.

GOVERNMENT NICKEL OPERATION at Nicaro, Cuba, are in for still more Congressional investigating by a House Government operations subcommittee headed by Rep. Jack Brooks (D-Tex.). Next on the agenda is a thorough review of Freeport Sulphur Co.'s Moa Bay plant supply contract. Brooks has hinted that the contract, under fire for months, was influenced by U. S. ambassador to London John Hay Whitney's connections with Freeport and the Administration. Freeport officials recently denied this charge in advance of the hearings, which are scheduled to continue this month.

Labor This Month

MINE-MILL STRADDLES RECESSION TROUBLES: Attempts to stir up business for the nonferrous mining industry has the International Union of Mine-Mill and Smelter Workers caught in the middle. Their domestic efforts—via a Congressional campaign for higher tariffs, etc., —are getting full attention. The "Bible" of Congress—The Congressional Record—is printing the Mine-Mill stand in full through its representatives in Congress. But this score was knocked down by the South American tour troubles of Vice President Nixon, which started a review of tariff policies towards South American ore. At this point it's a standoff. But the recession goes on as layoffs increase and the four-day week begins to hit across the mines. Mine-Mill members aren't unhappy about the latter. It means share-the-work for more members. The nonferrous union isn't alone in its job problems. This month will probably show a peak jobless total hovering around the 6-million mark.

UNIONS SEEK PROP FOR LABOR'S REPUTATION: Priority project among the top brass at AFL-CIO headquarters, which includes Federation president George Meany, United Auto Workers' chief Walter Reuther and Steelworker's head David McDonald, is now to halt the fading influence of organized labor. Corruption revelations in Congress over the past year have hurt—bad. Unions are feeling the effects in organizing failures, disturbances among the public generally, and angry reactions in Congress.

In private conferences, labor leaders are devising plans for counteracting this trend. It's a quiet program, just getting under way. And, it has a long way to go. But here's the strategy devised so far to hold off any further anti-union sentiment coming in the wake of revelations by the McClellan Senate rackets hearings as the union leaders offer kid glove to Congress. Anticipating some new legislation that will tell labor how to run its affairs, the union officials are talking compromise. While they don't favor any Government interference in how they elect officers or otherwise handle their business, they're not showing anger. Meany, Reuther and company were burned in 1947 by the Taft-Hartley Act when they refused to compromise on legislation. The law was passed over their strongest objections. Remembering this, they're willing to discuss possible changes in T-H and may even support some.

ORGANIZING KEEPS A BACK SEAT: No new membership drives have been held in recent years, but the AFL-CIO quietly investigated prospects recently. The idea was that they might find a new approach that could sell unionism and accomplish, at the same time the lift for the fading union name. The new tactic this time was to hire a private pollster to take a look at the South and find out labor's prospects for gaining new members—at a $35,000 price tag. The results weren't surprising. Although the report favored some devices over others, it frankly stated that the chances right now were out the window.

THE UNION HARD-SELL TO THE PUBLIC: Frankly concerned over what the housewife and the man-in-the-street are thinking about unions, a program has been worked out to sell the union cause. The hundreds of organizers—who are finding life pretty dull right now—are getting new jobs. They'll be public speakers. The AFL-CIO and some of its largest unions are sending out their organizers to appear before civic, church and social groups and talk about unions and the good things that labor accomplishes. This looks to be a slow procedure.

HIGH COURT JOLTS UNION PICKETS: Labor's strike weapon has been severely dulled by a recent Supreme Court decision against violence or threatened violence on the picket line. In the past, states have been able to halt picketing where violence threatens even though the case might be under Federal jurisdiction. Now, the states can go farther than just halting the action. Where a would-be worker has been threatened by a picket line and barred from work, he can sue in a state court not only for loss of wages but for personal damages—whether injured or not. Union leaders anticipated a flood of costly legal suits.

MARKETS

Subsidy for U. S. Minerals? Record Fabricator Copper Stocks. Lead Lower.

The *E&MJ* index of nonferrous metal prices for May dropped to 164.65% of the 1922-'24 average, from 165% in April. The drop in lead to 11.712c offset the slight increase in copper and tin.

Subsidy proposals for copper and other mineral products reached the Senate May 23, in the form of a bill from Secretary of the Interior Seaton. The bill provides that the Secretary shall make payments to U. S. mining companies of certain maximum amounts per unit of production and that the amounts of production or sales come within certain annual and quarterly limits.

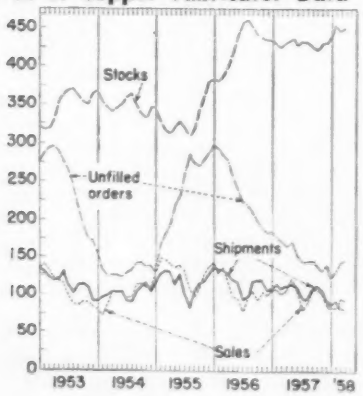
A	B	C	D
Copper del.			
3½c per lb	27½c	1,000,000	1,032,168
Lead, common N.Y.			
3¾c per lb	14¼c	350,000	205,788
Zinc, PW St. L.			
2½c per lb	12¾c	550,000	410,712
Fluorspar f.o.b.			
$8 per st	$48 st	180,000	174,896
Tungsten trioxide f.o.b.			
$18 per stu ct.	$36 stu	375,000 stu	256,644

A is the maximum subsidy, B is the maximum to which the miners sales price plus the subsidy can come and C the maximum amount in short tons on which subsidy would be paid per year. D is March 1958 output at an annual rate except fluorspar, based on 4th quarter 1957 and tungsten on February 1958.

In cases in which no sales are made the firm would be paid according to the market value at "the time of processing." Presumably the company could withhold its output from the market and collect the subsidy. The final form of the bill might prohibit this; it is possible some firms might continue to accumulate inventory, in which case this would help pay for it. But it is not likely and it is possible the subsidy could lead to output increases and sales on the market which could reduce the market price to well below present levels. The bill does not in any sense provide minimum prices and the lower the prices fall in the U. S. the less foreign material will be imported. It is even possible prices could drop below the "best" price—B less A, above.

When sales exceed quarterly limits the Secretary may adjust payments so as to distribute them "equitably among the producers." But the payments will not be denied to any producer whose sales for the quarter are not over: copper—2,500 tons, lead—1,250 tons, zinc—1,250 tons, fluorspar—1,250 tons, and tungsten ore—3,000 stu. No payments are to be made for material eligible for the Government stockpile on any program. This reduces the copper amount by about 115,000 tons—San Manuel and White Pine. The latter runs out in about a year. Tungsten payments are limited to 15,000 stu per firm per mining district. If eligible sales are less than the maximum, inventory material mined since July 1, 1956 may receive the subsidy but the two may not exceed 25,000 stu per quarter and 15,000 stu is the maximum amount eligible per quarter from inventory.

U. S. Copper Fabricator Data



U. S. Copper Association data, thousands of short tons, through April. Sales, shipments and unfilled orders are for fabricated products. Stocks also include refined copper. Sales and shipments are two months moving averages.

Copper sales in the U. S. in May were slightly under April; shipment data are not yet available but are probably down from April also. Foreign sales in May were down about 10 to 15% from April and about 25% from March. World stocks of refined copper held by producers rose to 501,500 tons. World deliveries to fabricators in April were the lowest since August 1955, when U. S. firms were on strike, except for July which is seasonally low.

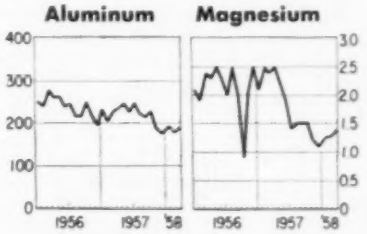
Custom smelters in the U. S. sold well in May relative to their lower intake and so were not accumulating metal. They raised the price to 24c May 23 and to 24¼c May 27 and 24½c June 2. But 25c copper was getting a lower proportion of the market. The Chuquicamata strike ended after about 40,000 tons were "lost." It may produce at the maximum in order to offset the loss. Phelps Dodge is cutting output by about 42,000 tons annual rate. It had already cut back about 63,000 tons in four steps (*E&MJ*, February 1958, p 114). The firm said it has sufficient stocks to meet any upsurge in demand. Anaconda announced it was cutting output by 10%, about 1,200 tpm; it will close its Leonard mine in Butte. U. S. fabricators' stocks of copper and copper in products rose to 5.6 months' supply in April. April data showing the ratio of stocks to shipments for the last six years follow:

1953	1954	1955	1956	1957	1958
3.0	3.3	2.8	3.5	3.7	5.6

The Australian government will submit a bill to Parliament this fall that would let the present price of copper drop from £A330 (33c) to about £A285, the difference to be made up by a subsidy. An import duty tied to outside copper prices would prevent the market price from going below £A285. The £A330 price has been maintained by import restrictions. Low cost firms, probably Mt. Isa, would not be eligible for the subsidy.

Lead was dropped from 12c to 11½c per lb New York by Asarco May 14, and to 11c June 2; others followed. Asarco said May 14 it was still about 2½c above the rest of the world and had been as much as 4c above. Sales of lead in the U. S. were very low in May. They were under April and may have been the lowest on record. Shipment data are not yet available. GSA asked for tenders late in May and ODM said this would be the last.

Zinc sales in the U. S. were a little better than in April but still low. Zinc Institute data for April showed stocks jumped 17,500 tons to 221,171. Shipments of Special High were only 15,353 tons; the monthly average in 1955 was 33,552 and in 1957 it was 28,180. Prime Western shipments were 29,847 tons; this includes nearly all the 5,927 shipped to the stockpile. The monthly average in 1955 was 45,232 and in 1957 it was 38,514 tons. London zinc was about 7.7c all month.



Net shipments of aluminum and magnesium mill products in millions of pounds per month. From U. S. Department of Commerce *Facts for Industry*.

Kaiser Aluminum's complaint that GSA was not accepting all the metal its "put" contracts called for was rejected by GSA. GSA said the firm's difficulties were partly dependent on having expanded well beyond what the market can absorb and on large imports of metal on term contracts. Reynolds is cutting output in several plants, probably by about 50,000 tons annual rate. Ormet, owned by Revere and Olin-Mathiesen, started producing metal. It will have 180,000 tons per year by the end of 1958. Both Revere and Olin will be regular sellers of pig and ingot. Reports persist that U. S. primary producers seek higher tariffs. Chances are poor. Fabricators will oppose them for metal but would probably welcome them for products. Canada would be the main loser.

Average Prices May *(E&MJ Quotations)*

Copper:	
Electrolytic, domestic refinery	24.298
Electrolytic, export refinery	21.944
Lead:	
Common, New York	11.712
Common, St. Louis	11.512
Silver and sterling exchange:	
Silver, New York, per oz.	88.625
Silver, London, pence per oz.	76.101
Sterling Exchange	281.572
Zinc:	
Prime, Western, East St. Louis	10.000
Prime, Western, delivered (g)	10.500
Tin:	
New York Straits	94.563
Gold per oz. U. S. price	$35.000
Quicksilver, per flask	$229.231
Antimony, (E&MJ) (d)	32.590
Antimony, bulk, Laredo	29.000
Antimony, in cases, Laredo	29.500
Platinum, refined, per oz.	$68.154
Cadmium (a)	155.000
Cadmium (b)	155.000
Cadmium (c)	155.000
Aluminum, 99% plus ingot	26.100
Magnesium, ingot	35.250
Nickel (f)	74.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers quotations.

(b) Cadmium average based on the average of the producers' and platers' quotations.

(c) Cadmium average based on platers' quotation.

(d) Domestic 5 tons or more but less than carload lots, packed in case f.o.b. New York.

(f) Contract price, f.o.b. Port Colborne U.S. duty included.

(g) Delivered where freight exceeds 0.5c.

"Free" Gold Market

Private trading volume increased 18%. No major Soviet sales were reported. American gold losses continued, exceeding $1.1-billion since the first of the year. Some U. S. private hoarding abroad was evident. International dealings were again heavy in Paris and London. Near Eastern and Asiatic centers were active. Smuggling into India was reported increasing. Pick's World Currency Report quotes on "free gold" per fine oz as follows:

	COINS		BARS (12.5 kg)	
	Apr. 30	May 31	Apr. 30	May 31
NEW YORK, transit	.....	.....	$35.08⅛	$35.08⅛
MANILA	$41.75	$42.00	36.00	36.00
HONG KONG	46.00	46.50	38.20	38.50
BOMBAY	61.25	61.75	59.00	59.75
TANGIER	40.60	40.75	35.21	35.22
BEIRUT	40.50	41.12½	35.23	35.25
PARIS	40.75	41.15	35.75	36.66
BUENOS AIRES	38.50	38.65	36.45	36.50

Note: Prices are quoted at the free or black market value of the U. S. dollar in the local markets.

Custom Smelter Copper Price

Based on flat price and E&MJ-average price sales in U. S. for month of April reported by American Smelting & Refining Co.: electrolytic copper in standard shapes, adjusted to nearest ⅛c; ¼c deducted for selling commission.

Delivered Consumers' plant	23.625 lb
F.o.b. refinery	23.225 lb

Major Metals

U. S. DAILY AND AVERAGE PRICES

May 1958	Electrolytic Copper (a) Domestic	(b) Export	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis	Aluminum Primary Pig 99%	Straits Tin New York
1	24.325	21.925	12.000	11.800	10.500	10.000	24.000	94.000
2	24.450	22.075	12.000	11.800	10.500	10.000	24.000	94.250
3	No Market	22.075	12.000	11.800	10.500	10.000	24.000	94.250
5	24.550	22.100	12.000	11.800	10.500	10.000	24.000	94.000
6	24.175	22.250	12.000	11.800	10.500	10.000	24.000	94.125
7	24.475	22.200	12.000	11.800	10.500	10.000	24.000	94.500
8	24.225	21.925	12.000	11.800	10.500	10.000	24.000	95.000
9	24.225	21.900	12.000	11.800	10.500	10.000	24.000	95.500
10	No Market	21.900	12.000	11.800	10.500	10.000	24.000	95.500
12	24.050	22.125	12.000	11.800	10.500	10.000	24.000	94.875
13	24.225	22.250	12.000	11.800	10.500	10.000	24.000	94.500
14	24.550	22.075	11.500	11.300	10.500	10.000	24.000	94.625
15	24.350	21.650	11.500	11.300	10.500	10.000	24.000	94.875
16	24.225	21.575	11.500	11.300	10.500	10.000	24.000	94.500
17	No Market	21.575	11.500	11.300	10.500	10.000	24.000	94.500
19	24.125	21.500	11.500	11.300	10.500	10.000	24.000	94.375
20	24.150	21.750	11.500	11.300	10.500	10.000	24.000	94.500
21	24.425	21.725	11.500	11.300	10.500	10.000	24.000	94.375
22	24.050	21.800	11.500	11.300	10.500	10.000	24.000	94.375
23	24.400	21.925	11.500	11.300	10.500	10.000	24.000	94.500
24	No Market	21.925	11.500	11.300	10.500	10.000	24.000	94.500
26	24.125	Holiday	11.500	11.300	10.500	10.000	24.000	94.500
27	24.300	22.075	11.500	11.300	10.500	10.000	24.000	94.500
28	24.475	22.225	11.500	11.300	10.500	10.000	24.000	94.500
29	24.375	22.125	11.500	11.300	10.500	10.000	24.000	94.750
30	———	21.950	———	Holiday	———	———	———	———
31	No Market	21.950	11.500	11.300	10.500	10.000	24.000	94.750
AVERAGES FOR MONTH								
May	24.298	21.944	11.712	11.512	10.500	10.000	24.000	94.563
AVERAGES FOR WEEK								
May								
7	24.395	22.104	12.000	11.800	10.500	10.000	24.000	94.188
14	24.255	22.029	11.917	11.717	10.500	10.000	24.000	95.000
21	24.255	21.629	11.500	11.300	10.500	10.000	24.000	94.521
28	24.270	21.990	11.500	11.300	10.500	10.000	24.000	94.479
CALENDAR WEEK AVERAGES								
May								
3	24.300	21.892	12.000	11.800	10.500	10.000	24.000	94.104
10	24.330	22.046	12.000	11.800	10.500	10.000	24.000	94.771
17	24.280	21.875	11.667	11.467	10.500	10.000	24.000	94.646
24	24.230	21.771	11.500	11.300	10.500	10.000	24.000	94.438
31	24.319	22.065	11.500	11.300	10.500	10.000	24.000	94.600

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

May 1958	Silver (c) New York	Silver London	Sterling Exchange	Gold London	Gold (d) United States
1	88.625	76.125d.	281.7812	249s. 2¾d.	$35.00
2	88.625	76.125d.	281.6875	249s. 1½d.	35.00
3	(e)	(e)	(e)	(e)	35.00
5	88.625	76.125d.	281.4218	249s. 3½d.	35.00
6	88.625	76.125d.	281.2500	249s. 6½d.	35.00
7	88.625	76.125d.	281.0937	249s. 7¾d.	35.00
8	88.625	76.125d.	281.4062	249s. 9d.	35.00
9	88.625	76.125d.	281.4375	249s. 6¾d.	35.00
10	(e)	(e)	(e)	(e)	35.00
12	88.625	76.125d.	281.5312	249s. 6d.	35.00
13	88.625	76.125d.	281.5000	249s. 5d.	35.00
14	88.625	76.125d.	281.5312	249s. 5½d.	35.00
15	88.625	76.125d.	281.6250	249s. 5d.	35.00
16	88.625	76.125d.	281.6562	249s. 5d.	35.00
17	(e)	(e)	(e)	(e)	35.00
19	88.625	76.125d.	281.7187	249s. 4d.	35.00
20	88.625	76.125d.	281.7500	249s. 4¼d.	35.00
21	88.625	76.125d.	281.7500	249s. 4½d.	35.00
22	88.625	76.125d.	281.6875	249s. 5d.	35.00
23	88.625	76.125d.	281.6250	249s. 4½d.	35.00
24	(e)	(e)	(e)	(e)	35.00
26	88.625	Holiday	281.6250	Holiday	35.00
27	88.625	76.125d.	281.6875	249s. 5¼d.	35.00
28	88.625	76.125d.	281.6875	249s. 5⅝d.	35.00
29	88.625	75.875d.	281.5625	249s. 5¾d.	35.00
30	Holiday	75.875d.	Holiday	249s. 5d.	Holiday
31	(e)	(e)	(e)	(e)	35.00
AVERAGES FOR MONTH					
May	88.625	76.101	281.572	—	35.00
AVERAGES FOR WEEK					
May					
7	88.625	—	281.447	—	35.00
14	88.625	—	281.481	—	35.00
21	88.625	—	281.700	—	35.00
28	88.625	—	281.663	—	35.00

Calendar Week Averages: New York Silver: May 3rd, 88.625; 10th, 88.625; 17th, 88.625; 24th, 88.625; 31st, 88.625.
(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.400c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflect prices obtaining in the open market and are based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.125c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingots; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West effective April 9, 1958, commanded a premium of 1c per pound over the current market for Prime Western; Special High Grade 1.25c effective April 9, 1958.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points (almost all U. S. lead is corroding grade).

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

MARKETS *(Continued)*

London Metal Exchange Quotations

	COPPER				LEAD				ZINC				TIN			
	Cash		3 Mo.		Current Month		3 Mo.		Current Month		3 Mo.		Cash		3 Mo.	
May	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked
1	177¾	178	179½	179¾	72⅞	73⅛	73⅛	73⅜	62¾	63	63	63⅛	730	730½	733	734
2	179½	180	181	181½	73½	73⅝	73⅝	73⅝	63	63¼	63⅛	63⅜	730½	731	733½	734
5	179¾	180	181	181½	73	73⅛	73⅛	73¼	62¾	63	63⅛	63⅛	730	730½	732	733
6	179¼	179½	180½	181	72¾	72⅞	72¾	73	62¾	62⅛	62⅝	62¾	730	730½	733	733½
7	177¾	178	179	179½	72½	72⅝	72½	72⅝	62⅛	62⅜	62¾	62⅞	730	730½	733½	734
8	177	177¼	178⅝	179	72½	72½	72½	72½	62⅛	62⅛	62⅝	62½	731	731⅞	735½	736
9	176⅝	179	180½	181	72⅛	72⅝	72½	72⅝	63¼	62⅝	62½	62⅝	726	737	740	740½
12	179¾	180	181¾	181½	72⅝	72⅞	72½	73	62¾	62⅝	62⅝	62¾	733	733½	737	737½
13	179¼	179⅝	181	181½	72½	72¾	72½	72⅝	61½	61⅝	61⅞	62	730½	731	733½	734
14	177	177½	179¼	179½	72	72¼	72½	72⅝	61⅛	61¼	61⅝	61⅞	730	730½	733	733½
15	176⅜	177	178½	178¾	72	72½	72¼	72½	61¼	61⅝	61½	62	730	730½	733	733½
16	177¼	177½	179¼	179½	72½	72¾	72½	72¾	61	61¼	61⅝	61⅝	730	730½	732½	733
19	178	178¼	180	180¼	72	72½	72¼	72⅝	61¼	61⅝	61⅝	61⅝	730	730½	733	733½
20	176¾	177	178⅝	179	72	72½	72¾	72½	61⅝	61½	61⅝	61½	730	731	734	735
21	177½	177⅝	179½	180	71⅞	72	72¼	72⅝	61⅝	61½	61¾	61⅝	730	730½	733½	734
22	178½	178¾	180¾	181	71⅝	71⅞	72¼	72½	61½	61⅝	62	62½	730	730½	733	733½
23	179	179½	181¾	182	71¾	71⅞	72¼	72½	61¼	61⅝	61⅞	62	730	730½	733	733½
26	Holiday															
27	180	180¼	182¼	182½	71¼	71⅝	72	72¼	61½	61¼	61¾	61⅜	730	730½	732½	733
28	181½	181¾	183¾	184	71	71¼	71⅞	72	61½	61½	61⅞	62	730	730½	733	733½
29	181¼	181¾	183¾	184	70⅝	71	71⅝	71⅝	61½	61⅝	62	62½	730	730½	733	733½
30	179¼	179½	182¼	182¾	70½	70⅝	71½	71⅝	61¾	61¾	62¼	62½	730	730½	733	733½
Av'g's.	£178.798		£180.756		£72.137		£72.473		£61.854		£62.262		£730.798		£733.976	

Prices are for the official a.m. session in pounds sterling per ton of 2240 lb. Copper basis wire bars, lead 99.97%, zinc 98% and tin min. 99.75%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated. tons of 2,000 lb. unless otherwise noted. St—short ton; lt—long ton. (p) duty paid.

MISCELLANEOUS METALS

May 31, 1958

Aluminum ingot, 99 plus % lb.		26.1¢
Antimony, spot, lb. less than carload, in cases		32.59¢
In bulk, carload lots, f.o.b. Laredo		29.00¢
Imported, 10 ton min. (p), 99½%		23¢
Bismuth, ton lots, lb.		$2.25
Cadmium, commercial sticks, delivered, lb.		$1.55
Calcium, lb. ton lots, 98%, cast		$2.05
Chromium, 97% grade, lb. contract del.		$1.29
Cobalt, 97 to 99%, per lb. eff. Feb. 1, 1957		$2.00
Germanium, per gram, 10,000 gram lots	(c)38¢ @	(d)45½¢
Indium, troy oz.	$1.25 @	$2.25
Lithium, lb. 98%	$9.00 @	$11.00
Nickel, cathodes, lb (a)		74¢
Other sales, reg. sellers		74¢
Sales by dealers, etc.		74¢
Magnesium, 99.8% carloads, lb. producer's plants, Velasco, Texas, eff. Apr. 16		35¼¢
Palladium, troy oz.	$17.00 @	$19.00
Platinum (wholesale lots), troy oz.	$63 @	$70
Quicksilver, flask of 76 lb., 25 flasks or more	$229 @	$231
Selenium, 99 plus %, lb—(Feb. 19, 1958)		$7.00
Silicon, minimum 97%, carloads, lb.		22¢
Semi-Conductor grade, lb.		$350
Tellurium, lb.		$1.65
Thallium, 100 lb. or more, lb.		$7.50
Titanium, 99.3 plus, grade A-1, max. 3% iron, lb. (b)		$2.05

(a) Eff. Dec. 6, 1956; incl. U. S. duty; (b) Effective April 1, 1958. (c) Delivered; (d) f.o.b. plant.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$34.00 @	$35.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:		
44% Cr_2O_3 no ratio	$24 @	$25
48% Cr_2O_3 3 to 1 ratio	$46 @	$55
Iron Ore, Lake Superior, Lower Lake ports, long ton:		
Old Range bessemer		$11.85(e)
Mesabi bessemer		$11.60(e)
Mesabi, non-bessemer		$11.45(e)
Lead (Galena), 80%, Joplin, Mo., ton		$134.52
Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties, c.i.f. U. S. ports, import duty extra, export duty included $1.10 @ $1.15; both duties excluded, $.965 @ $1.015. Long-term contract nominal.		
Molybdenum Ore, 90%, per lb. of Mo f.o.b. mines	$1.18 @	$1.23
Columbium-Tantalum per lb., combined oxides 10 to 1 ratio	$1.05 @	$1.10
Tungsten Ore, per stu of WO_3:		
Foreign 60%, c.i.f. U. S. ports, duty extra	$9 @	$11
U. S. scheelite, f.o.b. mill	(a)$17 @	$22
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines		31¢
Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton.		$56

(a) Nominal. (e) Eff. 1958 shipping season.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered		5¼¢
Cobalt Oxide, 72½% to 73½%, per lb. eff. Dec. 1, '56	$1.52 @	$1.55
Copper Sulphate, 100 lb eff. Jan. 13, '58		$10.70
Germanium Oxide, gram		27½¢
Molybdic trioxide, technical, per lb. of Mo	$1.38 @	$1.41
Imported, incl. 37¢ duty	$1.75 @	$2.05

ALLOYS

Ferrochrome 65 to 70%, per lb. of Cr. (4-9% C)		28¾¢
Ferromanganese, 74 to 76%, per lb., ships. pt.		12¼¢
Ferromolybdenum, 58 to 64% Mo, lb. of Mo contained	$1.68 @	$1.74
Ferrosilicon, 50% per lb. of Si f.o.b. shipping point (3-19-57)		14.20
Ferrotungsten, 72 to 82%, lb. of W contained		$2.15
Ferrovanadium, per lb. of V delivered	$3.20 @	$3.40
Silicomanganese, max. 1½% carbon, lb., contracts		12.8¢
Spiegeleisen, per long ton, 10 @ 21% grade eff. Jan. 7		$182.50

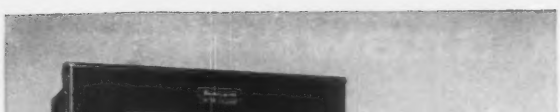
NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (Canadian funds) ton:		
Crude No. 1	$1,470 @	$1,810
Crude No. 2	$788 @	$1,155
Spinning fibers	$353 @	$593
Shingle fibers	$190 @	$220
Paper stock	$120 @	$142
Waste	$82 @	$86
Shorts	$27 @	$75
Asbestos, f.o.b., Vancouver, B. C. (Canadian funds):		
Crude No. 1		$1,522
Spinning fibers	$494 @	$787
Shingle fibers	$142 @	$325
Asbestos, Vermont, f.o.b. Hyde Park:		
Spinning fibers	$353 @	$383
Shingle stock	$172 @	$190
Paper stock	$114 @	$145
Waste, stucco or plaster		$82
Refuse or Shorts	$39 @	$72
Barytes f.o.b. cars:		
Georgia, crude, per ton		$18
Missouri, 94% $BaSO_4$, per short ton	$16 @	$18
Crude oil well grade, min. 4.3% sp. gravity, st (a)		$18
Imported, c.i.f. Gulf Ports, st	$16 @	$18
Bauxite, long ton, f.o.b. point of shipment:		
Domestic, crude, 50 to 52% (not dried)	(c)$ 5.00 @	$5.50
Domestic, chemical, 55 to 58%	(c)$ 8.00 @	$8.50
Domestic, abrasive, 80 to 84%	(c)$18.00 @	$18.50
Imported metallurgical, per lt, f.o.b. Br. Guiana, dep. on grade		$7.14
Feldspar, bulk ton:		
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @	$22.50
Glass feldspar, white, 20 mesh	$10 @	$12.50
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$37 @	$41
60% effective CaF_2	$33 @	$36.50
Acid 97% concentrate, bulk, ton (eff. 12-1-56)		$50.00
Some sellers quote		$55
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @	$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington		$46
Mica—Domestic, f.o.b. mines. Punch 7¢ to 12¢ per lb. according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to $1.10; 2 x 2-inch, $1.10 to $1.60; 2 x 3-inch, $1.60 @ $2.10; 3 x 3-inch, $1.80 @ $2.30; 3 x 4-inch, $2.00 @ $2.60; 3 x 5-inch, $2.60 @ $3.00; 4 x 6-inch, $2.75 @ $4.00; 6 x 8-inch, $4.00 @ $8.00. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $30 @ $55 per ton. Scrap, $20 @ $30.		
Ocher, Georgia, ton, in sacks	$26.50 @	$32.00
Pyrites, Spanish, per long ton unit of S. c.i.f. atlantic ports		Not quoted
Sulphur, per lt, f.o.b. U. S. mines: bright		$23.50
dark		$22.50
Mexican, for use in Mexico, per metric ton, f.o.b. mines, 280 to 395 pesos, depending on use	$22.40 @	$31.60
For export f.o.b. vessel, lt, dep. on grade	$22 @	$24
Talc, f.o.b. works, ton:		
New York, purified	$18.00 @	$20.00
Vermont, extra fine		$12.50
Tripoli, Missouri, ton:		
40-mesh, cream colored		$50.00

(a) Some restricted sales at $11.50. (b) Corrected. (c) Nominal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces		$66.00
Steel, f.o.b. Pittsburgh, billets, net ton		$77.50
Structural shapes, Pa., Ala., etc, 100 lb.	$5.10 @	$5.275



27 TON pull test shows 4-way expansion of O-B Shell and Plug!

On the left, a plug from an O-B Bail-Type expansion unit. On the right, an identical plug after tensioning to 54,000 pounds — *6 times* the normal bolt load!

The test was made with a special bolt installed in a 1¾ inch hole drilled in quartzite by an O-B customer operating a South African gold mine.

As shown in these unretouched pictures, the plug was compressed 22% and elongated over 30% by the tremendous pressures exerted against it. But, because those expansion pressures were distributed evenly four ways, reducing unit stresses to an absolute minimum, the O-B plug refused to break and release the bolt.

Four-way expansion is *another* reason why "they go up easy *and stay put!*"

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co. Ltd., Niagara Falls, Ont.

PLUG BEFORE TEST

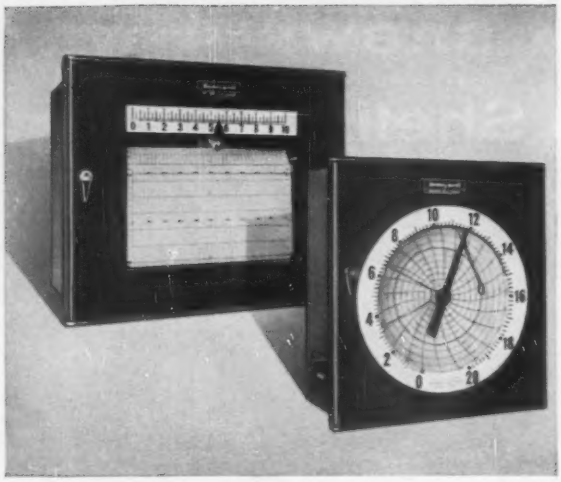
PLUG AFTER TEST

4827-M

Ohio Brass

O B

SHELLS AND PLUGS

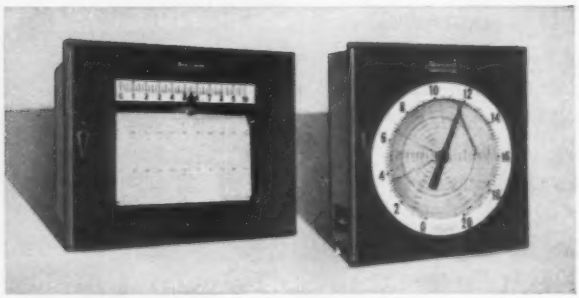


Precision Class 15 Line of *ElectroniK* instruments. Calibrated accuracy, ± .25% of span. Complete selection of many types of indicating and recording models, including electric and pneumatic controllers of most advanced type, and multi-point monitoring or recording of 2 to 400 points.

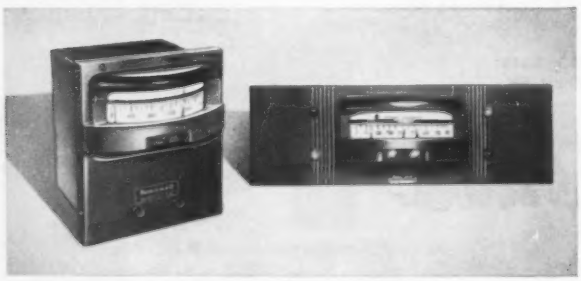
for accuracy,
versatility,
price

. . . Let your application decide which Honeywell instrument

fits your needs



Special Class 14 Line of *ElectroniK* instruments. Calibrated accuracy, ± .5% of span. Priced lower than the Precision line. Strip chart and circular chart instruments, circular scale indicating controllers. With various types of electric control.



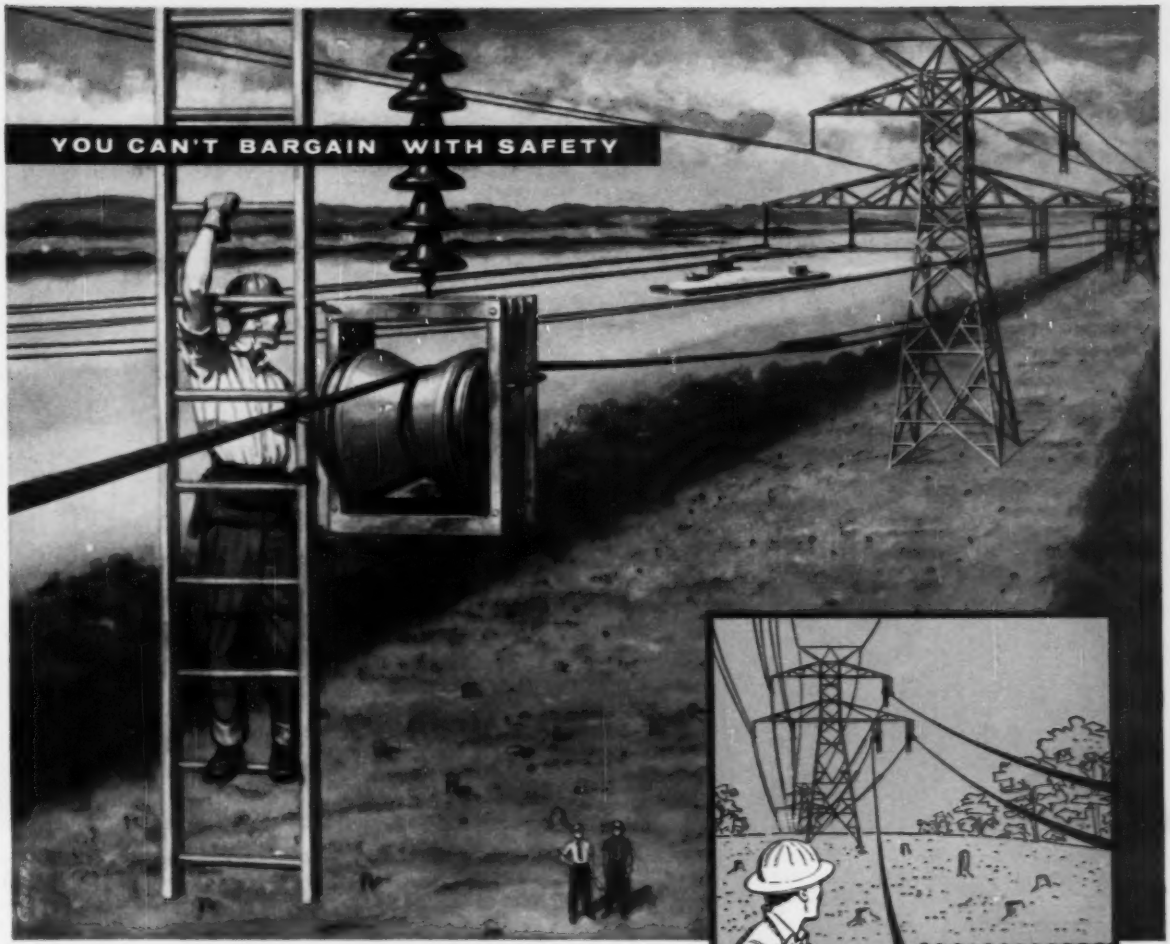
Millivoltmeter Instruments. Dependable, accurate service at low cost. Plug-in unit design speeds servicing. *Pyr-O-Vane* controllers, in either horizontal or vertical case, offer snap-action or time-proportioning electric control.

No need to "shop around" for instrumentation to fit your temperature measurement or control problem. From the Honeywell line—the most complete and diversified in the industry—you can be sure of getting exactly what your application requires.

Your local Honeywell engineer will be glad to consult on your requirements. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls



Stringing conductors on towers carrying a live 330,000 volt circuit is a tough job. Hoosier Engineering Company of Columbus, Ohio, does it by threading conductors up to 1¾" through a tension machine and pulling them over sheaves on the tower arms with 9000 foot lengths of Wickwire Wire Rope. On jobs like this, where men's lives are at stake . . .

rope failure can be fatal

Whether you're stringing power lines, pulling drill pipe, or handling other hazardous hoisting jobs—don't bargain with safety. "Bargain" wire rope can cause more trouble and expense than you expect. Buy wire rope on the basis of *quality* . . . buy Wickwire Rope.

For extra strength—buy Wickwire's Double Gray IWRC extra improved plow steel wire rope

CF&I

WICKWIRE ROPE
A CF&I PRODUCT

LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso Farmington (N. M.) • Fort Worth • Houston • Kansas City • Lincoln • Odessa (Tex.) • Oklahoma City • Phoenix • Pueblo Salt Lake City • Tulsa • Wichita

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WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans New York • Philadelphia

5924

Stripping overburden at iron ore mining operation near Greenville, Ala., this Caterpillar D9 Tractor with No. 9S Bulldozer "pushes more dirt than any other piece of equipment I have ever seen," says Owner J. Bryce Smith.

Caterpillar-built "track team" produce 100 carloads a week

J. Bryce Smith, owner of the Smith Mining Co. of Luverne, Ala., will tell you he has a winning Cat-built "track team" at work on his iron ore strip mining operation near Greenville, Ala. Here's what he says:

Cat D9 Tractor with No. 9S Bulldozer—"With the 'dozer it will push more dirt than any piece of equipment I have ever seen."

Cat D6 Tractor with No. 6A Bulldozer—"Although we've put more than 5,400 hours on it, the head and pan have never been removed. It has just as much power as when it was a month old. This machine has long since paid for itself."

Cat No. 977 Traxcavator—"We use it for a variety of jobs, and it does all types of work well."

Completing the team are a powerful Caterpillar D8 Tractor with No. 8S Bulldozer and several Cat Engines driving pumps for the iron ore washing plants and powering a shovel. Average overburden is eight to ten feet, and as deep as 25 feet. The company is shipping an average of 100 carloads of iron ore per week from Greenville.

High production like this—with minimum operating expense—is what mine owners everywhere get from modern Caterpillar-built equipment. The 320 HP (flywheel) D9, for example, handles about 12 cu. yd. on every pass with the No. 9S Bulldozer. Despite its massive size, it is one of the easiest of all tractors to operate because of power-boosted controls and excellent visibility. It's available with either torque

How Cincinnati Plant Stops Valve Maintenance Problem

Operated for 5,400 hours, this Cat D6 Tractor with No. 6A Bulldozer has the same power it had when it was a month old, according to Mr. Smith. "It has long since paid for itself," he says.

This Caterpillar No. 977 Traxcavator, here seen loading out overburden, is used for many different jobs on the Smith Mining Co. operation. "It does all types of work well," Mr. Smith reports.

helps Smith Mining Co. at iron ore strip mine

converter or direct drive with the exclusive Caterpillar oil clutch.

The versatile No. 977 is typical of the Traxcavator line. It's built from the ground up as an excavator-loader. About 26 sq. ft. of ground-gripping track provide tremendous traction to crowd the 2¼-yd. bucket full every time. Controls are easily reached from the operator's comfortable seat.

These are just a few of the star performers on the Cat-built "track team." Get the full story on them from your Caterpillar Dealer. He'll prove the dollars-and-cents value of his track-type equipment in mining operations, demonstrate on your job. And he stands ready with *dependable* parts and service.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

LEADING "TRACK TEAM" FOR MINING

LOOK FOR YOUR CATERPILLAR DEALER IN THE YELLOW PAGES

How Cincinnati Plant Stops Valve Maintenance Problem

CRANE Valves End Excessive Shutdowns for Repairs

About every four months maintenance men of Sealtest, Central Division, Cincinnati, Ohio, had to replace worn, leaky discs and thread-stripped stems of valves used on the dairy's pasteurizing tanks.

The high cost of down time, labor and parts was only a part of this maintenance problem. Each time the valves had to be repaired, the dairy suffered a drop in production and faced the possible loss of 600 gallons of milk.

Upon recommendation, Crane No. 9 bronze globe valves, with quick-change composition disc, were installed. Today—two and one-half years later—these Crane valves, opened and closed a dozen times a day, have not cost the dairy one cent for repairs, or any loss in production or milk.

Here again is proof that Crane valve economy is never measurable in terms of first cost. You get it in years of maintenance-free service.

That's why more prudent buyers specify Crane valves for every service.

LEARN WHY Crane bronze valves with composition discs are so economical for service on steam, hot or cold water, oil or gas. Write to address below for Circular AD-2222.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855 — Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

YELLOW STRAND

"POWERSTEEL"

gives up to 100% more service!

Wherever you have heavy loads, severe abrasion, that's the place for Yellow Strand "POWERSTEEL®!" Many users report 25% to 100% longer life than ordinary wire rope. "POWERSTEEL" is designed, manufactured and recommended for draglines – shovels – dozers. It spools freely, resists wear and crushing. Made from wire of the highest carbon content and tensile strength of any B & B Rope, "POWERSTEEL" is drawn to the most rigid specifications, is strong and tough.

"POWERSTEEL" can reduce non-productive time for rope replacements. You'll see that it always pays to buy the best – "POWERSTEEL!"

Yellow Strand Wire Rope is always nearby – always in ample supply – at your Broderick & Bascom distributor. See him soon! Broderick & Bascom Rope Co., 4203 Union Blvd., St. Louis 15, Mo.

Yellow Strand®

Wire Rope

"Because of outstanding performance," says **J. B. Rich,** *Pres.—*

"Gilberton Coal's electric-powered excavators use General Electric systems–exclusively"

"One shovel has operated 6000 hours with only routine maintenance"

Gilberton Coal Company is a fast growing firm mining a rich anthracite coal vein in eastern Pennsylvania. Because Gilberton has received dependable, continuous operations from General Electric equipped shovels and draglines, all their electric-powered excavators now utilize G-E motors and control.

General Electric Engineers work closely with shovel and dragline manufacturers to carefully match all characteristics of electrical amplidyne control, motors, and generators with those of the shovel or dragline. This co-ordinated electrical-mechanical design results in rugged, rapidly responding machines like those setting performance records at Gilberton Coal Co.

What's more, in quarry and mining areas throughout the nation, you will find G-E renewal parts distributors and complete, efficient, around-the-clock service from near-by General Electric Service Shops.

When You Plan to purchase an electrical excavator for your mining operations, specify a machine powered and controlled by General Electric system-engineered equipment. Write Section 663-49, General Electric Co., Schenectady, N. Y.

Engineered Electrical Systems for the Mining Industry

GENERAL ELECTRIC

32-YD WALKING DRAGLINE takes a 50-ton bite of overburden, dumps it, and swings back for another—***every 50 seconds.*** Tremendous power (4950 hp) and precisely responding controls regulate this performance. Heart of the G-E electrical system in this Bucyrus-Erie dragline is the 1500-hp synchronous motor and 600-hp induction motor driving generators which feed d-c power to drag, hoist, swing and walking motors. The dragline operates 130 hours per week, year 'round.

ENGINEER'S FIELD REPORT

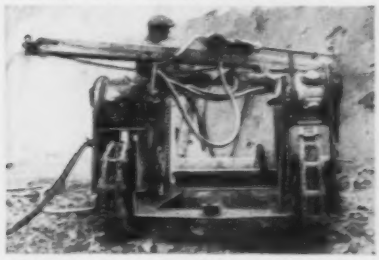
PRODUCT **CHEVRON VISTAC OIL**

FIRM **NEVADA-MASSACHUSETTS COMPANY**
Tungsten, Nevada

Special Oil holds wear to minimum for 15 yrs.

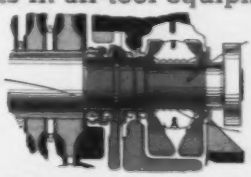
Nevada-Massachusetts Co., operators of one of the world's largest tungsten mines, has relied on Chevron Vistac Oil for 15 years, to keep their rock drills and other air tools operating at peak efficiency. "We use Vistac because it stays on the tools whether they're wet or dry. Doesn't create drag, either...we get full power with minimum tool wear," says general manager Eldridge Nash. Oil's tough, protective film resists high operating temperatures, helps this firm's rock drills (above) bore fifteen 2½-inch blasting holes averaging twelve feet in depth, in just eight hours. Nevada-Mass. does extensive underground mining at this site as well as surface operations.

Despite heavy abrasive dust from drilling in Hornfels and Scheelite, (above), Chevron Vistac Oil keeps rock drills working smoothly. Lubricant is used in 60 rock drills, 3 wagon drills, plus 25 tuggers (air motors) on hoist equipment, loaders, slusher hoists and sump pumps.



Special wagon drill, built at mine, uses Ingersoll Rand DA 35 rock drill to bore horizontal holes up to 18 ft. deep. EIMCO air motors lubricated with Chevron Vistac Oil power tracks for fast and easy maneuvering.

Why Chevron Vistac Oil cuts costs in air-tool equipment



- Atomizes quickly and completely—carries evenly over all parts. Prevents excessive fogging and has no unpleasant odor.
- Additives help form tenacious, oily, pressure-resistant film in wet or dry conditions—cuts wear and power loss.
- Resists high temperatures and oxidation. Stays fluid at low temperatures.

For More Information on this or other petroleum products, or the name of your nearest distributor, write or call any company listed.

CHEVRON Industrial Lubricants

TRADEMARKS "CHEVRON," "VISTAC" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, 225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY, P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS P. O. Box 862 • El Paso, Texas

"Not merely to sell; but to serve . . . not only to make good steel products; but to make them still better . . . not only to fulfill today's requirements; but to anticipate tomorrow's—these are the principles that constantly guide CF&I."

G. F. Franz
President

Grinding Mill Bulletin #5

In the previous ads in this series, we have discussed improved grinding through ball rationing of the makeup charge. The criterion for a successful grinding operation, of course, is the *total* cost of grinding. Let us now look at some reasons why careful selection of grinding balls is important in terms of grinding cost.

Selection of Grinding Balls— Effects on Total Grinding Cost

When determining which is the best type of grinding ball, the *total cost of grinding*, fixed and variable, should be kept clearly in mind. Grinding balls are purchased for one purpose only—to grind—and they're expected to perform pretty much alike. Price and resistance to wear are too often the only factors considered, when grinding balls are selected. While these are of prime importance, a more farsighted approach to grinding ball selection is warranted. *A ball of better grinding ability will lower fixed costs per ton of ore ground—lowering total grinding costs.*

Effect of Grinding Ball Type

Under identical conditions, is there a difference in the ability-to-grind of various types of grinding balls? The answer is yes—and this fact has been proven in extensive tests at several plants. Although these differences, expressed in percentages, are small, the result, in terms of over-all grinding costs, can be relatively large. When cast iron balls are used, their lower effective density (due to voids within the balls) and their irregular shapes are factors that tend to reduce mill throughput. It is accepted that homogeneous forged steel grinding balls, because of their density and more truly spherical shape, give higher mill throughput.

Effect of Surface Texture

In attrition grinding of ore particles, the grinding action of a ball charge receives its energy from the rotating mill shell. This energy is transferred from the mill shell to the adjacent layer of balls which transfer part of this energy to the next layer, and so on toward the center. Thus, ball movement and rotation depends on friction between the balls. And this friction is greatly dependent on the steel surface texture (grain structure) of each ball in the charge. Balls that are too hard slip excessively and lose this advantage of energy transfer. Therefore mill throughput, power utilization and—in the final analysis—total grinding costs are definitely affected by ball surface texture.

Effect of Grinding Ball Uniformity

A "bad" batch of balls that split in the mill can reduce drastically mill throughput and increase total grinding cost. It is therefore essential that grinding balls be chosen on the basis of proved performance and reliable uniformity, if total grinding costs are to be kept in line.

You'll find no better choice than CF&I Grinding Balls. They are always made from special analysis steel with the ideal toughness-hardness balance to assure optimum grindability plus maximum wearability. CF&I Grinding Balls are available in all standard diameters from ¾" to 5". They are carefully inspected—throughout production and immediately prior to shipment—to ensure freedom from surface pits, circumferential ridges or other surface defects. You'll find CF&I Grinding Balls ideally suited to keep your total grinding costs at a minimum.

For a reprint of the article on which this series of five ads is based, please write on your company letterhead to: Mining Supply Department, The Colorado Fuel and Iron Corporation, P. O. Box 1920, Denver, Colorado.

OTHER CF&I STEEL PRODUCTS FOR THE MINING INDUSTRY
CF&I Grinding Rods · CF&I Grader Blades · CF&I Industrial Screens
CF&I Mine Rail and Accessories · Wickwire Rope · CF&I Rock Bolts

FORGED STEEL GRINDING BALLS
THE COLORADO FUEL AND IRON CORPORATION

Albuquerque · Amarillo · Atlanta · Billings · Boise · Boston · Buffalo · Butte · Chicago · Denver · Detroit · El Paso · Ft. Worth · Houston
Kansas City · Lincoln · Los Angeles · New Orleans · New York · Oakland · Oklahoma City · Philadelphia · Phoenix · Portland · Pueblo
Salt Lake City · San Francisco · San Leandro · Seattle · Spokane · Wichita 6121

The Eimco 630 Excavator High Capacity Loading, rugged construction and low maintenance costs.

"YOU CAN'T BEAT AN EIMCO"

This phrase, coined by thousands of Eimco users since Eimco introduced successful overhead loading 26 years ago, and used in mines throughout the world has been earned through an unexcelled, honest and dependable performance by machines always assigned to the task of hard severe service.

Robust, gadget-free, hell-for-stout construction that is typical of all Eimco Loaders is also found in the 630, pioneered by Eimco for every phase of trackless underground work.

Today the results speak for themselves. Hundreds of repeat orders from customers who have learned through their own experience — that the statement "You can't beat an Eimco" is a true fact.

An Eimco 630, similar to the machine pictured above, has loaded more than 375,000 tons at a verified average cost for maintenance of only 2.9 cents per ton loaded.

Yes! This is the type of heavy-duty equipment you get from Eimco — this is the equipment to buy to meet low metal prices and show a profit.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N.Y. Cleveland, Ohio · Chicago, Ill. London, England · San Francisco, Calif. Gateshead, England · El Paso, Tex. Paris, France · Birmingham, Ala. Milan, Italy · Duluth, Minn. Pittsburgh, Pa. · Seattle, Wash. Johannesburg, South Africa

B-329

Roebling Presents

THE NEWEST CONCEPT IN WIRE ROPE

*Herringbone**

two ropes in one!

Here is a combination that has proved itself during three years of field testing. A welcome addition to Roebling's great line of wire ropes, Royal Blue *Herringbone* is both a regular lay and lang lay wire rope!

So, in one rope you have the greater flexibility and abrasion resistance of lang lay construction *plus* regular lay's superior stability under severe operating conditions.

Preformed Herringbone is made of two *pairs* of lang lay strands, and two strands of regular lay which separate the two pairs of lang lay—all of it made of Type 1105 rope wire.

For three years Herringbone has been used for general hoisting, holding and closing lines, shovel ropes, wagon scraper ropes and dragline ropes. Without reservation, its performance has been superior to that of any other rope used for the same jobs . . . even in the hands of inexperienced personnel! *Its proven capabilities clearly suggest its use for all jobs where steel core ropes are normally used.*

See your Roebling salesman for all the facts or write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey. Roebling Herringbone, the two-in-one rope to meet the *doubly* stringent demands of today's economy.

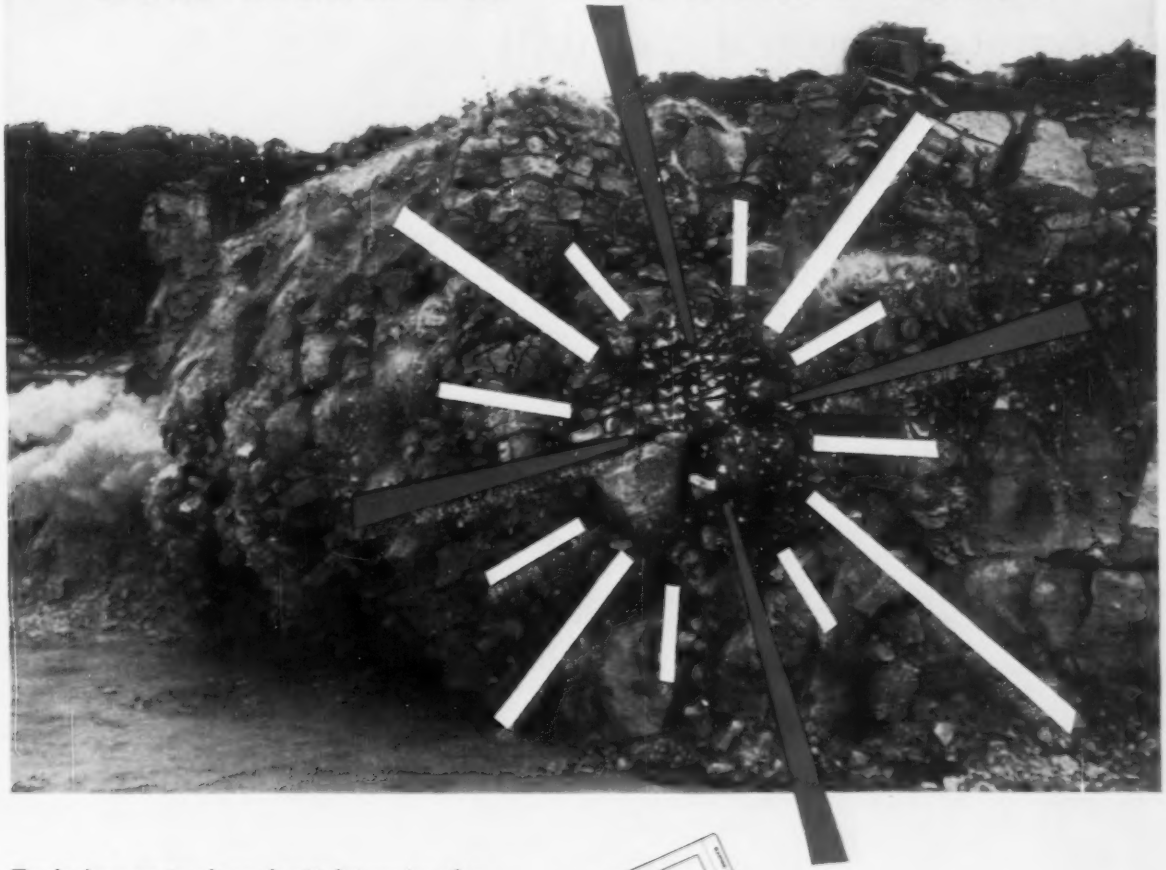
*Reg. app. for

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

HERRINGBONE
WIRE ROPE

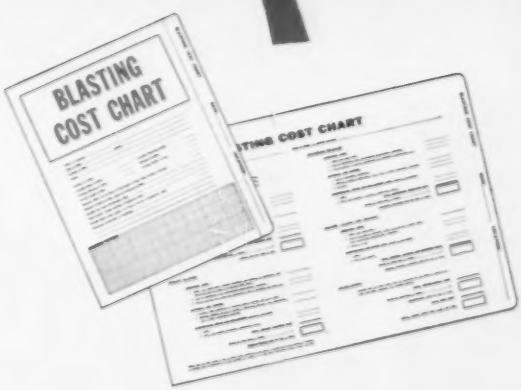
HOW MUCH DID THIS BLAST COST?



Explosives costs alone don't determine the value of a given blast. The explosives you use have a direct effect on the whole operation: drilling, digging, hauling and crushing.

You can find out, quickly and easily, the true, complete cost on any blast by using the new, simplified computing method developed by Atlas. It's called the Blasting Cost Chart, and it's yours without cost or obligation.

Use this new method to learn your real blasting costs. It will help you plug profit leaks and come out money ahead in your blasting. Your nearest Atlas representative will show you how the chart works, and you can keep the actual figures within your own organization.



EXPLOSIVES
DIVISION
ATLAS
POWDER COMPANY
WILMINGTON 99, DELAWARE
offices in principal cities

In mining, you need machines that stay on the job because down time will ruin you!"

To be more specific, I. D. Gibson of Glenwood Mining Co., Glenwood, Alabama, says: "This is one operation you have to keep going, because down time will ruin you. We have found Caterpillar products give us better on-the-job results and I don't think there is anything that will give you longer life."

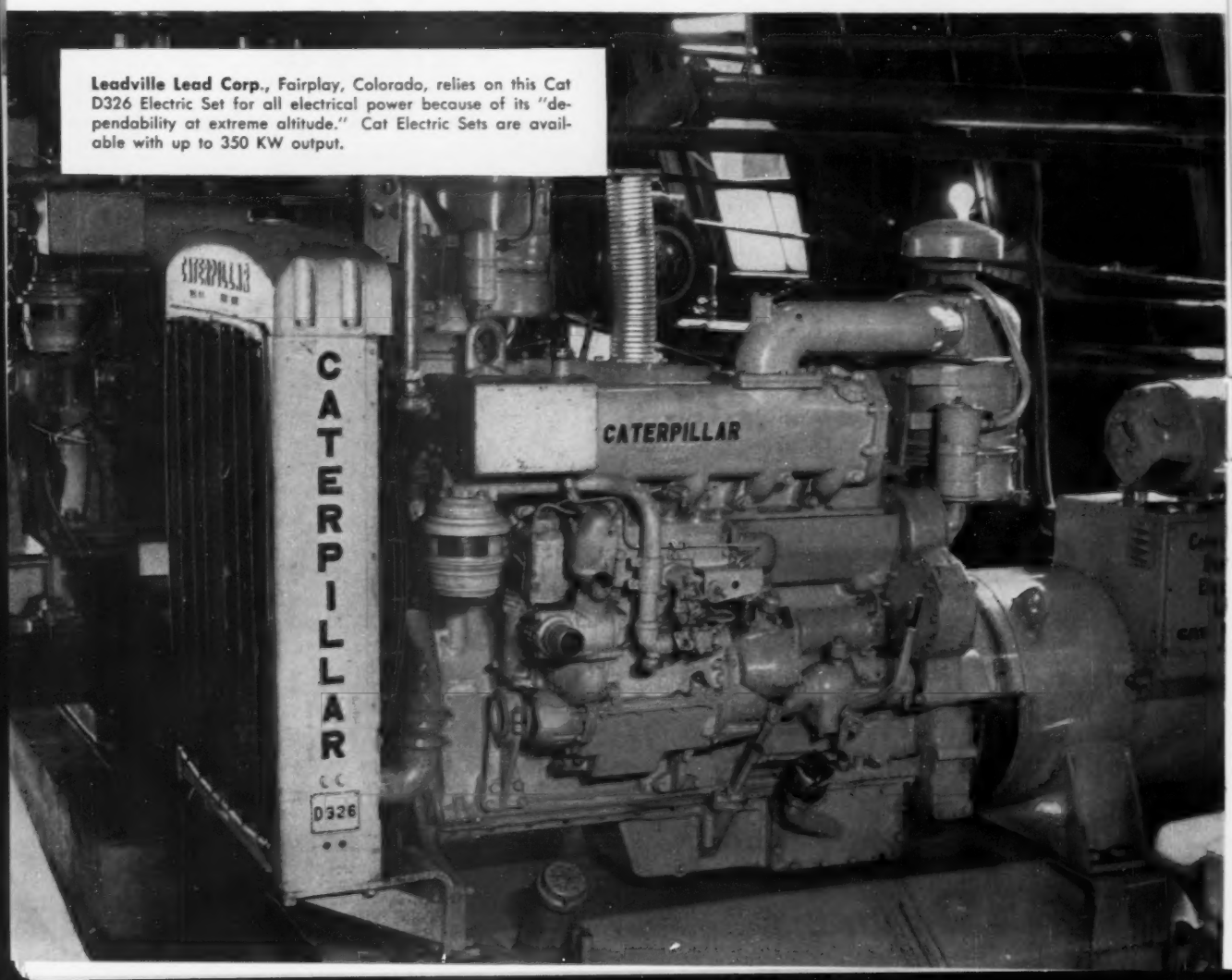
Mine owners operating at a profit have Cat power on electrical loads and powering shovels, pumps, compressors, drills, crushers, hoists, locomotives and shuttle cars. If *you* have a job that can't stop, you will be wise to rely on Cat power 100%. Electric Sets are available up to 350 KW and engines to 650 HP (maximum output capacity).

These engines are the same basic power plants used in the Cat-built Tractor line. So by specifying Cat Engine power, your parts stock can be cut.

Wherever you buy, Cat power can be supplied. The largest and most fully equipped dealer organization in the heavy construction field gives you telephone-quick service. And more than 150 manufacturers offer Cat power in their new equipment.

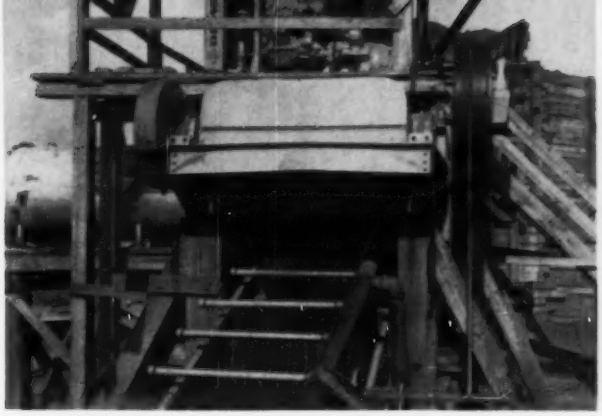
So see your nearby Caterpillar Dealer for your power needs. And be sure to specify Cat power when selecting new equipment.

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U.S.A. Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.



Leadville Lead Corp., Fairplay, Colorado, relies on this Cat D326 Electric Set for all electrical power because of its "dependability at extreme altitude." Cat Electric Sets are available with up to 350 KW output.

call KE for plant expansion or new facilities
call KE for plant expansion or new facilities



I. D. Gibson of Glenwood Mining Co., Glenwood, Alabama, relies on a number of Cat Engines, including this D337 (Series F) because, "In mining, you need machines that stay on the job because down time will ruin you." It's the reason why mine operators from coast to coast prefer Cat Engines.

This Lorain L50 with a Cat D318 Engine here performs for Davis Bros.' iron ore stripping operation in Troy, Alabama. M. E. Davis, partner, says, "We're so well satisfied with the performance of our D318, I don't believe we will ever try to find if there is a better engine made."

Cat D8 Tractor removes overburden from iron ore at the Peeks Mine west of Glenwood, Alabama. The Glenwood Mining Company standardizes on Cat power in tractors, shovels, log washers and pumps. It's easier on operators and engine parts are interchangeable.

This Link-Belt LS98 Dragline is powered by a Cat D318. Here it is loading out overburden on a Glenwood Mining Co. job. For modern, heavy-duty diesel power, mining operations depend on Caterpillar — champion of the tough jobs.

BY CATERPILLAR

Cat diesel power is available in these excavators

American Hoist & Derrick Co.
Baldwin-Lima-Hamilton, Lima Div.
Bay City Shovels, Inc.
Bucyrus-Erie Co.
Byers Manufacturing Company
Dominion Engineering Works, Inc.
Fiorentini, Canada, Ltd.
Gar Wood Industries
Hanson Clutch Co.
Harnischfeger Corporation
Industrial Brownhoist Co.
Insley Manufacturing Co.
Koehring Company
Link-Belt Speeder Corp.
Little Giant Crane & Shovel Co.
Manitowoc Engineering Corp.
Marion Power Shovel Co.
Northwest Engineering Co.
Ohio Locomotive Crane Co.
Quick-Way Truck Shovel Co.
Sargent Engineering, Inc.
Sauerman Bros., Inc.
Thew Shovel Co.
Warner & Swasey (Gradall Division)
Washington Iron Works
Wellman Engineering Co.

Dept. EM6, Engine Division
CATERPILLAR TRACTOR CO., Peoria, Illinois, U. S. A.

Send me more information on Cat Engines.

- ☐ I am interested in general information.
- ☐ I would like the names of the 150 manufacturers who can supply Cat power in new equipment.
- ☐ I would like information about repowering.

Manufacturer _____ Model No. _____

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

E&MJ NEW PRODUCTS DIGEST

call KE for plant expansion or new facilities
call KE for plant expansion or new facilities

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has made KE a major engineer-contractor serving

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Ingenuity at work—produces better, faster construction, at lower cost; more efficient and profitable operation.

Ingenuity is a hallmark of Kaiser Engineers—has been for over 40 years of contracting. Experienced KE design and construction engineers can advance your new plant plans from conversation to completion, quickly, at lower cost. Or, they can undertake any single part of a project. One contract can cover all.

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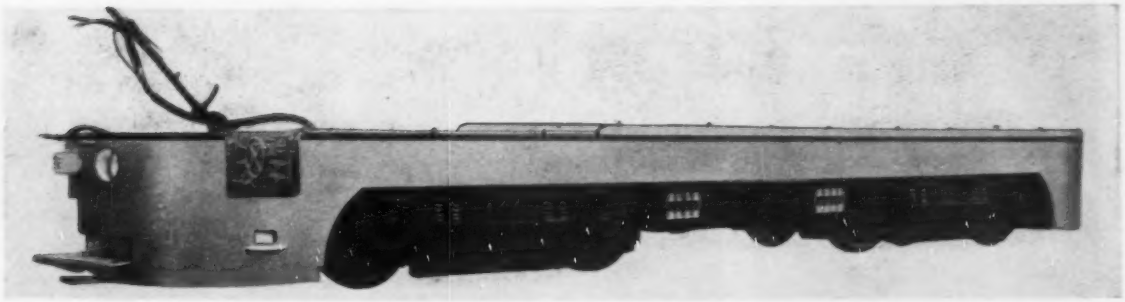
E&MJ NEW PRODUCTS DIGEST

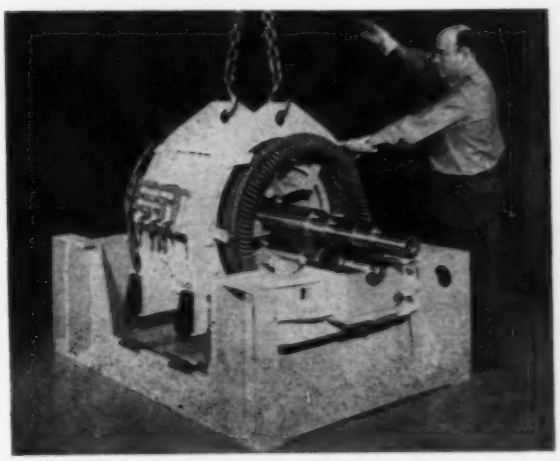


General Electric Mine Locomotive Takes 150-Ton Loads Down 6% Grade (1)

Four sets of brakes—dynamic, standard air, a special electromagnetic, and a manual parking brake—feature General Electric Co.'s new tandem 27-ton mine locomotive. Design can develop 54,000 lb of braking effort. A 250-ton load (four loaded mine cars and the locomotive) moving down an 8% grade at 8 miles an hour was stopped within 30 ft. Load was stopped automatically without an operator at the controls. Locomotive was designed to reach a difficult orebody. Braking system designed for this locomotive can be installed on any new locomotive, or even an old one with a long wheel base.

Herringbone Wire Rope Developed (2)

John A. Roebling's Sons Corp., subsidiary of Colorado Fuel & Iron Corp., has developed a new wire rope—a new construction combining the flexibility and abrasion resistance of lang lay rope (two pairs of strands) and the strength and flexure ability of regular lay rope (two pairs). Rope is made of Type 1105 wire, of 6x37 classification, and is suitable for running and winding applications.



Fully Accessible Large A-C Motors (3)

A-C motors in sizes from 250 to 7000-hp, depending on speed, in squirrel-cage wind or synchronous design, are now available from Westinghouse Electric Corp. in six basic designs and 30 frame sizes. Simplicity and accessibility to working parts are some of the advantages noted.

Allis-Chalmers Tests Gas Turbine for Tractors

A Boeing 502-10C gas turbine power unit has replaced the conventional diesel engine in an experimental version of what may be the crawler tractor design of the future. Named the Model P-91, the unit will be thoroughly tested to determine the gas turbine's ability to deliver the range of power and flexibility needed in a successful tractor engine. Gas turbine installed in the Allis-Chalmers HD-21 above has same horsepower rating as its diesel counterpart.

Warning to Truck Maintenance Men

Du Pont says get that anti-freeze out of your trucks before hot weather arrives. Anti-freeze, even the so-called permanent types, form acids that chew up the cooling system. "Permanent" label on anti-freeze solutions applies only for the winter season, not from year to year. Du Pont recommends these maintenance steps to prevent breakdowns: (1) Drain and discard anti-freeze; (2) Clean and flush the cooling system; (3) Check for leaks; (4) Refill with fresh, clean water and a chemical rust inhibitor.

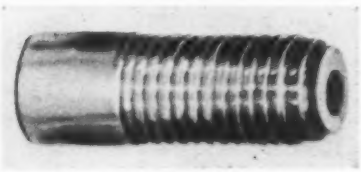
Automatic, Horizontal Continuous Centrifugal (4)

Capable of handling loads of up to 20.5 cubic ft of material per batch in its 66-in. dia drum, the continuous centrifugal developed by Chemical Machinery Div., Baker Perkins Inc., is driven by a 125-hp motor.

For more information on new products and for copies of the literature circle the proper number on the New Products reply card, give your name and address, and mail card to E&MJ.

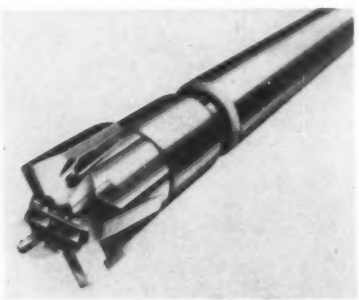
Dustless Stoper (5)

Ingersoll-Rand has developed a rock drill known as the Vacujet dustless stoper that sucks all dust and cuttings through the drill, then discharges them under pressure through a long hose to a container. Tank container or bag may be as much as 25 ft away from the machine.



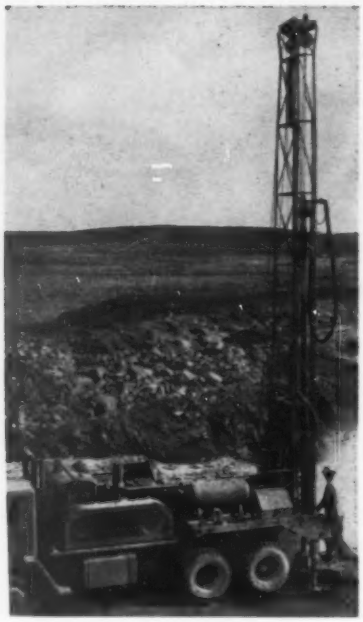
Round Drill Rods (11)

Brunner & Lay, Inc. is supplying 1½-in. dia round, hollow extension steels for use on the crawler-type blasthole drilling machines. Can be had in 10 and 20 ft lengths with K or 600 thread in carbon steel. Steel can be threaded for 600 bits on one end and for 400 bits on the other when used with a drill having a 1½-in. chuck.



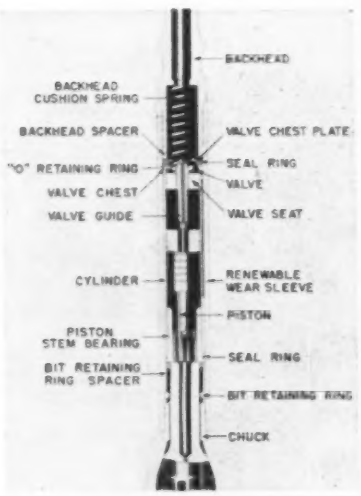
Down-the-Hole Percussion (12)

Unusual bit design is only one of the many features of Schramm, Inc.'s down-the-hole percussion drill tool. Developed for use with the Schramm Rotadrill, the tool has only three moving parts. Percussion action is confined within the tool at the bottom of the hole. Bit has 6 carbide tips which can be reground. Sizes available are 4½-in. bit, 6 in. and 6½ in.



Portable Rotary Drill (6)

Unit is mounted on a GF-660 Crane Carrier truck with a GMC 4-71 diesel engine which furnishes power for the rotary table. New unit is designed for both conventional rock or drag bits, and also the new down-the-hole tools. According to George E. Failing Co., the rig is recommended for drilling blastholes and taking cores.



Down-The-Hole Drill (7)

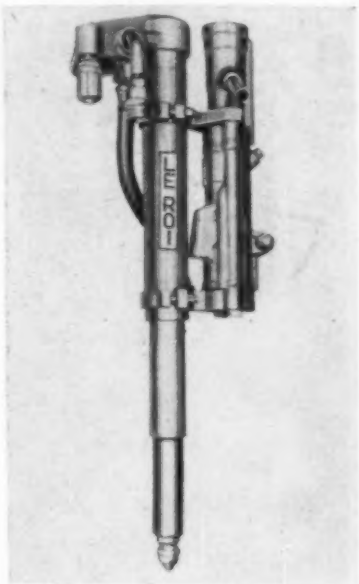
Ingersoll-Rand Co. announces a design change in the Depthmaster drill which was introduced in 1955. Change provides continuous hole cleaning air even when the drill is not operating. Depthmaster is available in three sizes for 4¾ to 7 in. blastholes.

Air-Blast Rotary Bit (10)

Chicago Pneumatic Tool Co. has available two types of Three-Cone Air Blast rotary bits—standard Air-Blast and Jet Air-Blast (shown above). In addition to the standard central air blasthole, the Jet model has three holes for high pressure air at the perimeter of the drill.

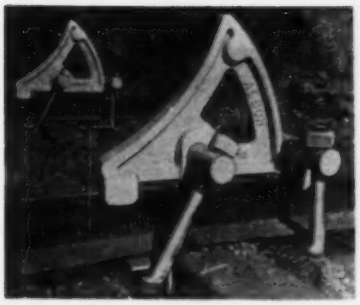
Optional S10 Stoper Size (9)

Le Roi Div., Westinghouse Air Brake Co., has modified the S10 Stoper to provide greater feed leg pressure and to insure positive oiling to chuck parts. Both the former 2¼-in. dia and a 2⅜-in. dia feed leg design are available.



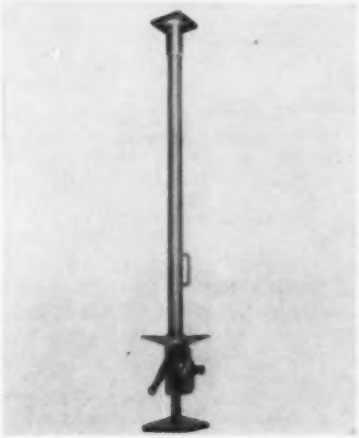
Heavy-Duty Stoper (8)

The S12VT heavy-duty stoper announced by Le Roi Div., Westinghouse Air Brake Co., has telescopic feed and a dust collecting system that is approved by the U. S. Bureau of Mines. Unit is available in feed lengths of 34 and 52 in. Drill steel required is ⅞-in. hexagonal with a ⅜-in. dia hole.



Adjustable Car Stops (14)

Used in sets and easy to install, the Aldon Car Stop requires no holes to be drilled, produces no rail joint interference, needs no special installation tools, and is semi-portable, according to Aldon Co.



Roof Bolt Recovery Jack (15)

Templeton-Kenly & Co. has added a roof bolt recovery jack to their product line that enables two men to recover up to 350 bolts a day. For 72-in. jack size, the unit weight only 36 lb.

Simple Safety Cable (16)

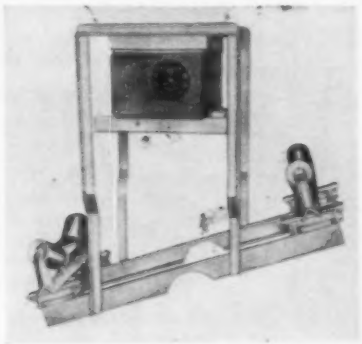
Small sturdy hand winch with ¼-in. wire rope and universal anchor clamp fitting enables the workman to enter a bottom-dump gondola car safely. Cable is stretched from one end of the gondola to the other, then the man attaches his safety belt to the cable. Device prevents man from falling through the bottom dump. Lowery Brothers, Inc.

Small Diameter Blasting (13)

Accomite, a non-nitroglycerin blasting agent, is available in 1½x16-in. size and is particularly suitable for limestone mining, according to American Cyanamid Co. Cartridge count is 45 per 50 lb. Fume classification is rated good, and water resistance as poor. Primer is required.

Quick Cable Changes (17)

Double Wedge Load Socket design permits one man equipped with a small sledge or hammer to release the cable in a few minutes. Clamp uses two wedges instead of the usual one, according to Page Engineering Co. Sizes available to accommodate wire cable from 1⅜ through 3⅛ in.



Totalizing Belt Scale (18)

Thayer Scale Corp. has introduced an inventory belt scale that recalibrates linearly, with operating capacities of 100 lb to 300 tons per hour. Thayer Plate Leverage System is said to be unaffected by dust, dirt, shock or vibration, and is guaranteed for the life of the scale.

Electrical Conduit (21)

American Metal Hose Div., American Brass Co., is offering three types of improved Sealtite flexible liquid-tight conduit. Type U.A. has P.V.C. cover over flexible galvanized steel in sizes from ⅜ to 1¼ in. Type E.F. is for machine tools, portable tools and heating devices in sizes from ⅜ in. through 4 in. Type C.S.A. meets Canadian Standards Association approval in sizes from ⅜ to 1¼ in.

Aluminum in Clamshells (19)

Owen Bucket Co. says that their clamshell buckets are available in 3 and 10 cubic yd capacity. Depending on bucket size, the use of aluminum saves as much as 1,000 lb in weight.

Improved Power Cable (20)

Use of a neoprene compound for the jackets on General Electric's Versatol Geoprene and Super Coronol Geoprene single-conductor power cables has cut moisture absorption rates by more than 50%, according to the company.

Tapered Roller Bearings (22)

Called Dua-face seal by Timken Roller Bearing Co., a new approach to sealing tapered roller bearings combines the features of an outside diameter seal and the face type seal. Dua-face seal is provided pressed onto the bearing cone to eliminate handling and assembly problems. Available on seven different bearing bore sizes—0.750 to 2.6875 in.

Full Circle Brakes (23)

Hi-Torque—said to be the first hydraulic drum-type brake with 360 deg expander tube actuation—was designed by B. F. Goodrich Aviation Products exclusively for large tractors, scrapers and earthmovers.

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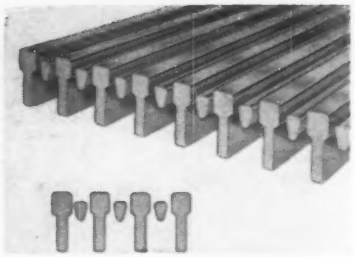


T-Wedge Screen (34)

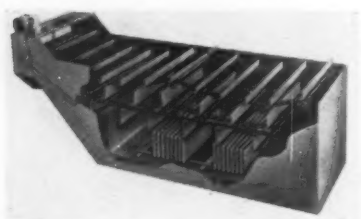
Wedge-Wire Corp. is now producing T-Wedge screen cloth which is most adaptable for flumes and vibrator use. Design combines two Wedge Wire profiles to eliminate guard bars, the Migh-Tee design serving as both guard and screen component.

Dial Your Conveyor Speed (35)

Dial-A-Torq multiple drive conveyor control system is available from U. S. Electric Motors Inc. Unit is easy to install and operate. Dial-A-Torq simultaneously modifies the slip of all motors on a conveyor system, but does not effect motor starting characteristics.

Sieve Shaker (36)

Soiltest, Inc. has developed a sieve shaker that rotates the sieve platform in a small circular arc at the same time it is swayed in a vertical arc. An impact is provided to the platform at the rate of 6 blows per revolution. Unit is available in 8 or 12 in. dia sieves, hand operated or motor driven.

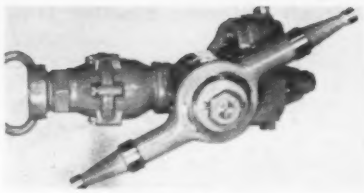


Delpark Water Filter (37)

Joy Mfg. Co. will sell and distribute the Delpark water filter for cleaning process water containing up to 10% solids. Joy plans to recommend the Depark unit in connection with the Joy Microdyne dust collector as well as a separate distinct unit. Unit will reduce water-borne solids content to less than 1% by volume. Delpark filter was developed by Industrial Filtration Co.

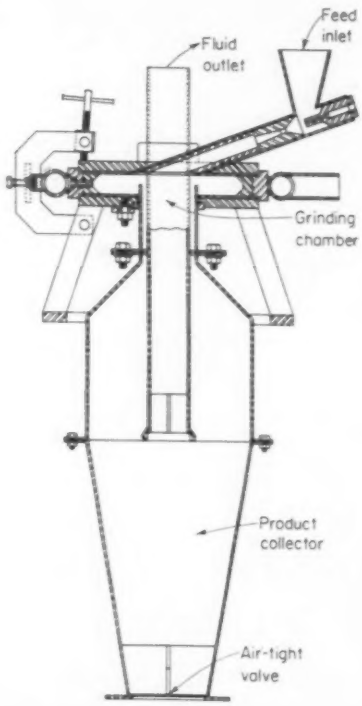
Indicating Flowmeter (38)

Seico Instrument Div., Eclipse Fuel Engineering Co. has enlarged and improved its line of flowmeters for air, gas and liquid. Standard instruments are now available in aluminum and brass bodies for pressures up to 2,000 psig. Special bodies are available for corrosive application.



Tank Cleaner (39)

High capacity, water driven, called the Jumbo Tank Cleaner, discharges up to 9400 gph through two revolving jets, each with 50 ft effective cleaning range. Sellers Injector Corp. offers other, smaller sizes in addition to Jumbo.



Fluid Energy Mill (40)

Sturtevant Mill Co. says that modifications to the Micronizer permits fluid energy size reductions down to one half micron size. Sturtevant makes eight different Micronizer sizes from 2-in. laboratory models up to 36 in. dia production models with capacity of two tons per hour depending on material to be ground. Fluid energy can be provided by air or steam as desired.

Vibrating Conveyor (33)

Cleveland Vibrator Co. is installing an all-steel vibrating conveyor in an Ohio foundry to transport hot sprues.

Plywood Pipe (41)

Molded plywood pipe in any diameter and lined with any type of material to fit customer needs is available from Plycraft, Inc.

Pocket ph Meter (42)

Beckman Scientific Instruments Div., has a small portable low-cost pH meter available with a pH range of 2 to 12 readable to 0.1. Encased in plastic, the unit weighs only 2 lb.

Safety Aids

For literature on Mine Safety Appliances Co. line of portable oxygen indicators check this number. Units measure and report oxygen content of gases from 0 to 25% O_2. **(43)**

Process Controls

Two-way, high-pressure solenoid valves are also available from Automatic Switch Co. Designed for tight shut-off at up to 1500 psi, these units are especially suited for hydraulic application. Available in ½ or ¾ in. pipe sizes. **(44)**

SLM Indicator measures transient differential pressures, both fast and slow, at any two points in a pneumatic or hydraulic system, says the Kistler Instrument Corp. **(45)**

Pneumatic pressure switch, which closes a 1200 w circuit under preselected pressure, suction or differential pressure over a range of from 0.1 in. WC to 1 psi, is being introduced by Bryant Industrial Products Corp. **(46)**

Analyze almost anything accurately, says Podbielniak, Inc., with their Podbielniak Chromcons. Three series covering 10 models that can analyze any gaseous or vaporizable liquid by fractional distillation and vapor phase. **(47)**

Automatic precipitator (the Cottrell) controls developed by Western Precipitation Corp. contain no tubes, relays or moving parts yet insure peak performance of the Cottrell electrostatic precipitator. Unit continually adjusts voltage to compensate for changes in conditions within the gas and dust stream. **(48)**

High-temperature pyrometer marketed by Robertshaw-Fulton Controls Co. can accurately determine temperatures in the 1000 to 3300 deg F range, depending on the model selected. For more information circle the number. **(49)**

For Your Files

This selected manufacturers' literature is free unless otherwise specified. If item is for sale, send request and money direct to manufacturer.

URANIUM EXPLORATION with geothermal instruments, a paper by A. L. Williams describing such instruments, is available from Geo-Thermal Research Corp. **(50)**

HOW AIR PHOTO interpretation provides essential soil and geological data for engineering projects is the subject of a 4-page folder available, from Aero Service Corp. **(51)**

BLAST HOLE DRILLING tool bulletin from Brunner & Lay, Inc. is 12 pages. **(52)**

PORTABLE DRILL STEEL grinder is illustrated in Atlas Copco literature. **(53)**

SLUSHER SCRAPERS in the Pacific Slushmaster line are illustrated in an 8-page bulletin. **(54)**

CRAWLER TRACTOR (HD-16) from Allis-Chalmers is illustrated in a 14-page bulletin. **(55)**

FORK LIFT TRUCKS from Allis-Chalmers are presented in a 16-page bulletin. **(56)**

BACK RIPPERS and automatic blade control mechanisms for tractors and graders are illustrated in Preco Inc. bulletins. **(57)**

HIGHWAY TRUCK tire data book prepared by B. F. Goodrich Co. is 42 pages. **(58)**

OFF HIGHWAY truck tire handbook from B. F. Goodrich Co. is 52 pages. **(59)**

SHOVEL-CRANE, the 1-yd LS-98 shovel, crane, dragline and hoe engineered by Link-Belt, is illustrated in a 24-page catalog. **(60)**

SELF-PROPELLED CRANE literature on the Model CR-35 Bantam is available from Schield Bantam Co. **(61)**

HARDENED CUTTING EDGES for bulldozers and scrapers are presented in Caterpillar Tractor Co. 8-page Hi-Electro bulletin. **(62)**

HEAVY-DUTY rear axles available from the motor truck division of International Harvester Co. are illustrated in a 4-page bulletin (CR-320-H). **(63)**

ELECTRIC HOISTS, with capacities of 500 to 4,000 lb for industrial plant use, are detailed in American Chain & Cable Co., Inc. Speedway bulletin. 8pp. (DH-133D). **(64)**

TURNTABLES, all-steel construction, are presented in Atlas Car & Mfg. Co.'s 4-page bulletin (1297). **(65)**

ROPEBELT CONVEYORS from Goodman Mfg. Co. are presented in an 8-page catalog (G-130). **(66)**

USE AND CARE of wire rope, a handbook for everyone who buys, sells, or uses wire rope, is available from Wire Rope Corp. of America (Wireco Brown Strand). 36pp. **(67)**

MOTORS — totally enclosed advantages are available without higher cost, says Lincoln Electric Co.—illustrated in 4-page bulletin (SB-1345 10M 557). **(68)**

LARGE INDUCTION MOTORS — ratings from 150 to 1250hp—are presented in Louis Allis Co. 16-page bulletin. (1950). **(69)**

IMMERSIBLE MOTOR bulletin from Louis Allis Co. is 4 pages (2300). **(70)**

HEAVY-DUTY capacitator-start induction-run single-phase integral horsepower motors in ¾ and 1½ hp, 1 to 3hp, and 1½ to 5hp with varying rpm ratings are available from Fairbanks, Morse & Co. **(71)**

GEARED COUPLINGS—Link-Belt's MC design—are illustrated in 4-page folder (2875). **(72)**

JAW-TYPE COUPLING has been added to the Browning coupling line, according to latest 12-page catalog (C-120-A). **(73)**

SELENIUM RECTIFIER power units are available from Syntron Co., according to 9-page bulletin (44634-1). **(74)**

PROPERTIES OF INCO-WELD A and I welding wire and electrode are presented in literature available from International Nickel Co. **(75)**

WELDING WIRE comparison chart has been prepared by Page Steel & Wire Div., American Chain & Cable Co., Inc. 4pp. (DH-1218-M). **(76)**

BRAZING MANUAL booklet prepared by All-State Welding Alloys Co., Inc. is an informative piece. 24pp. (21958). **(77)**

SUBMERGED ARC WELDING method and equipment, Lincoln Electric Co.'s Squirt Welder, are illustrated in 6-page release (5205.1). **(78)**

E&MJ NOT GOOD AFTER DEC. 1, 1958

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled. **JUNE 1958**

1	17	33	49	65	81	97
2	18	34	50	66	82	98
3	19	35	51	67	83	99
4	20	36	52	68	84	100
5	21	37	53	69	85	101
6	22	38	54	70	86	102
7	23	39	55	71	87	103
8	24	40	56	72	88	104
9	25	41	57	73	89	105
10	26	42	58	74	90	106
11	27	43	59	75	91	107
12	28	44	60	76	92	108
13	29	45	61	77	93	109
14	30	46	62	78	94	110
15	31	47	63	79	95	111
16	32	48	64	80	96	112

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8	24	40	56	72	88	104
9	25	41	57	73	89	105
10	26	42	58	74	90	106
11	27	43	59	75	91	107
12	28	44	60	76	92	108
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E&MJ NEW PRODUCTS DIGEST (*Continued*)

AIRCOMATIC WELDING WIRE pocket guide catalog prepared by Air Reduction Sales Co. contains 78 pages of information (2330). **(79)**

ANTI-CORROSION — the Niphos Process—which gives mild steels resistance approaching stainless steel in many applications is discussed in Tube Reducing Corp. literature. **(80)**

HOW TO FABRICATE cast stainless steels is the subject of an Alloy Casting Institute reprint from *Metalworking*. **(81)**

STEEL TUBING buyer's guide selection chart has been prepared by Joseph T. Ryerson & Son, Inc. (12-10). **(82)**

DUCTILE CAST IRON bulletin (No. 1102) prepared by T. B. Wood's Sons Co. shows how ductile iron castings are made in 12 pages. **(83)**

WET REAGENT FEEDERS and cone-type dry reagent feeders available from Denver Equipment Co. are illustrated in 4-page bulletin (F6-B9). **(84)**

CERAMIC MAGNET PULLEYS — permanent magnets for tramp separation on belt conveyors—are introduced in Stearns Magnetic Products Div., Indiana Steel Products Co. bulletin (P-1021). **(85)**

CAST IRON PULLEYS catalog from Hewitt-Robins, Inc. lists all standard pulleys and accessories manufactured by the company (J-15). 16pp. **(86)**

AIR-OPERATED VIBRATING feeders from Cleveland Vibrator Co. are illustrated in 4-page bulletin (1000). **(87)**

WASHING AND CLASSIFYING equipment catalog has been prepared by Eagle Iron Works. Catalog No. 58. 40pp. **(88)**

CRUSHING ROLLS bulletin (6637) prepared by Traylor Engineering & Mfg. Co. illustrates Traylor rolls in photograph and cutaway. 40pp. **(89)**

TYPE H JAW CRUSHERS bulletin just published by Traylor Engineering & Mfg. Co. contains 20 pages of data (6105). **(90)**

TUBULAR CENTRIFUGAL fans in the Dryer Electric Corp. line are illustrated in a 16-page publication. (TC-1-57). **(91)**

DUST COLLECTOR—American Air Filter Co., Inc. Skimmer centrifugal precipitator—is illustrated in a 4-page bulletin (276). **(92)**

HERMAN NELSON heating, ventilating and air conditioning equipment is detailed in American Air Filter Co., Inc. bulletin (701). 12pp. **(93)**

DUST DENSITY measurement and recording instruments are available from Bailey Meter Co., according to Bolometer Transmitter bulletin (E66-1). 4pp. **(94)**

SWIVELPILER — centrifugal-action bulk storage aid developed by Stephens-Adamson Mfg. Co.—is described in action in *S-A Conveyor*, Vol. 219. **(95)**

VIBRATING SCREENS—grizzly bar, concentric action, screening feeders, unbalanced pulley feeders and pulsating magnet types—are illustrated in Syntron Co. catalog (44791). 13pp. **(96)**

AIR MOVING EQUIPMENT for industrial use are detailed in DeBothezat Fans Div., American Machine & Metals, Inc. catalog-bulletin (DB 45-58). 19pp. **(97)**

THE AIRMERGE CONVEYING SYSTEM developed by Fuller Co. is illustrated in 16-page technical bulletin (B-2). System conveys bulk particles by air jets. **(98)**

SAFETY GLASSES designed to prevent the lens from being driven backwards toward the eye are described in American Optical Co. Safety Products Div. literature (F9700). 7pp. **(99)**

MOLDED GLOVES made of five types of rubber and synthetic materials are illustrated in Mine Safety Appliances Co. bulletin and selection guide (1310-2). 8pp. **(100)**

HEAD PROTECTION gear in the Mine Safety Appliances Co. line is illustrated in 15-page bulletin (0600-3). **(101)**

SCIENTIFIC SELECTION of safety talks that strike at the prime causes of accidents are described in bulletin available from National Safety Council (Book 8). **(102)**

WATER SUPPLY, industrial water pollution control, sewage treatment and air pollution control services available from Roy F. Weston, Inc. are described in a booklet now available. **(103)**

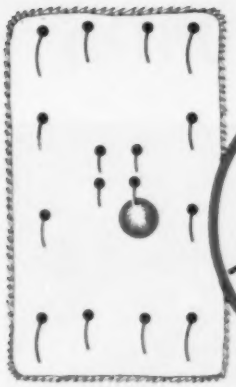
THINK OF WASTE DISPOSAL PROCESSES is the title of Nuclear Science and Engineering Corp.'s publication on nuclear waste control (bulletin 432). **(104)**

POSITIVE VISUAL indication of flow conditions within a pipeline is the subject of Schutte & Koerting Co. bulletin (No. 18W). **(105)**

ARMORED ROTAMETERS for high pressure and high temperature fluid flow rate measurement and control are illustrated in Brooks Rotameter Co. bulletin (130). 8pp. **(106)**

FLEXIBLE METAL HOSE catalog-bulletin prepared by Pennsylvania Flexible Metallic Tubing Co., Inc. contains 36 pages of details and illustrations. **(107)**

REAGENT FEEDERS—Model E in polyvinyl chloride by Clarkson Co.—are illustrated in 4-page bulletin. **(108)**

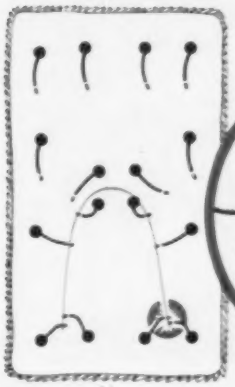


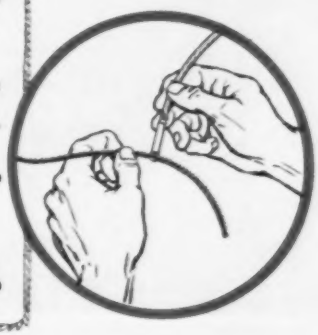
ONE LIT . . . 15 TO GO THE OLD WAY!

When Lighting Safety Fuse in a Round...

Why take chances?

NOW -- hook up in planned rotation with IGNITACORD®

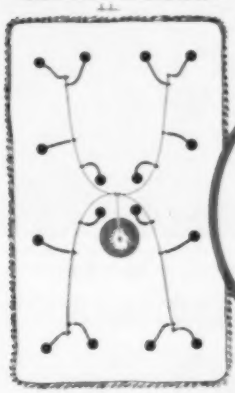




Instead of trimming the fuse at the face and then lighting each fuse "by hand," use this improved and safer way to shoot each hole in its correct firing order, *while your blaster is in a place of safety.*

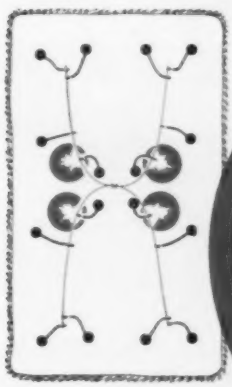
Cut the Safety Fuse in *equal* lengths and attach the blasting cap. On the other end of the fuse, attach an Ignitacord Connector. This is a metal shell similar to a detonating cap but color-marked with two colored bands for identification. The base contains an ignition charge and a slot to hold the Ignitacord. Prepare the primer cartridges and load the holes in your usual way.

1. Connect all holes with Ignitacord. This is a flexible cord with a core of Thermite. It acts like a continuous hot wire lighter, burning at a uniform rate with an intensely hot flame at the zone of burning. Time delay between holes is governed by the length of Ignitacord between them. Color marks at one-foot intervals make it easy to measure off each distance. Place the Ignitacord in each Connector slot and press the top flap down firmly to secure it in place. This also insures positive ignition of the connector.



2. Connect your lines of Ignitacord at the lighting point, tying them together firmly, as shown in the diagram. When all is ready to fire, light the Ignitacord at this point with a match. *Walk* to a place of safety.

3. The Ignitacord will ignite each connector, which in turn will ignite each length of Safety Fuse in your planned rotation. You'll get a blast you can be proud of!



THE ENSIGN-BICKFORD COMPANY

Simsbury, Connecticut • Since 1836

Safety Fuse, Primacord® and Detacord® Detonating Fuse, Ignitacord®, Quarrycord®, Pyrotechnical Devices and Blasting Accessories.

Ignitacord is made in two types. Type A is green — burns at a rate of 8 to 10 seconds per foot. Type B is red — burns at a rate of 16-20 seconds per foot. Each type is packed on spools containing 100 feet. Connectors are packed in stout cardboard boxes of 100 each.

Ignitacord is sold on the West Coast under the name of Spittercord® by the COAST MANUFACTURING & SUPPLY COMPANY.

WARNING *Ignitacord must not be used as a substitute for safety fuse, or in any place where an open flame is undesirable.*

IGNITACORD® and CONNECTORS

IG-1

Over-the-edge-dump

Operator of LeTourneau-Westinghouse Rear-

26 MILLION YARDS IN 30 MONTHS

The 207′ long *Franciscan* digs 50′ deep with ladders at 45°—pivots on two 80′ spuds. 8,000 hp AC synchronous motor driven pump—36″ intake, 30″ discharge.

Seagoing stern provides easy job to job movement. It's powered from shore, but designed for installation of on-board power plant.

9′ cutter head powered by 1,500 hp DC motor, tears tough abrasive Alameda sand deposits never before so successfully handled by a hydraulic dredge.

YUBA HYDRAULIC DREDGE

HALF A CENTURY OF DREDGE DESIGN, FABRICATION, MINING AND EARTHMOVING EXPERIENCE

Built by Yuba for Utah Construction Company, the *Franciscan* has been placing fill for a large Alameda shoreline community development, and for the huge Metropolitan Oakland International Airport expansion. According to John Yasich, internationally known expert and manager of Utah's dredging operations, and Utah Engineer Jack Mednick, this biggest dredge in the West has been doing an unusual job. Whether you're looking for 8″ or 30″ hydraulics—large or small clamshells or bucket ladders—or modernization of present equipment—consult Yuba first.

YUBA MINING DIVISION

675 EAST H STREET • BENICIA, CALIFORNIA

DREDGES • JIGS • TROMMELS • ROTARY FEEDERS
DREDGE PARTS • SCREEN PLATES • SLURRY PUMPS
CUSTOM ORE HANDLING EQUIPMENT

YUBA CONSOLIDATED INDUSTRIES, INC.

Over-the-edge-dump

Operator of LeTourneau-Westinghouse Rear-Dump can dump accurately and safely over edge of hopper or spoil pile because of machine's front-wheel drive, independent braking, and electric-controlled bowl. To dump, operator backs close to edge, sets brakes on rear wheels, leaving front wheels unbraked. He then flicks switch to instantly activate electric bowl-hoist motor. As bowl rises, it pulls prime-mover back, shortening wheelbase. Bowl swings deep behind rear wheels, stops rollback of material . . . casts it out and away. Drive wheels of prime-mover always stay on firm footing, for fast getaway in case bank begins to cave in.

COMPARE

- capabilities of your present haulers
- advantages of L-W Rear-Dumps

Hauls through soft, slippery areas

L-W Rear-Dumps haul safely through areas where other units bog down. Here's why: (1) Exclusive power-transfer differential, automatically transfers power from a slipping drive wheel to wheel on better footing. (2) 90° kingpin electric steer . . . independent of drive train . . . helps you "duck walk" out of trouble. Operator just turns prime-mover left, right, left, etc., to swing drive wheels ahead until they "walk" out and reach solid footing. (3) Rear-Dump can be "humped" forward, when bowl is empty, to get out of soft areas. Bowl is raised with front brakes locked and rear brakes released, shortening wheelbase . . . then bowl is lowered with rear brakes held and front released. Thus, without use of drive wheels, Rear-Dump "humps" forward.

No-drag "skid bottom" construction

There are no springs, hangers, tie-rods cluttering up the bottom of your L-W Rear-Dump. Simple "skid bottom" construction eliminates drag over dirt and rocks. Bowl is hitched to prime-mover through a horizontal yoke extending back from kingpin, and pivoted to body itself . . . just above and ahead of rear wheels. There is no frame or sub-frame to get out of alignment. Front-wheel drive and kingpin steer eliminate long drive shaft, hinged steering connections.

Big target for fast, easy loading

L-W Rear-Dumps' big, wide, unobstructed top makes an easy target for your shovel operators. Low, wide rear entry of this hauler lets dipper swing in smoothly, quickly . . . in one continuous arc . . . rather than the up-over-in, up-over-out motions needed with high-top trucks.

Big, single tires absorb shock, eliminate trouble of duals

4 giant, low-pressure tires dissipate vibrations and stress of high-speed hauls . . . absorb shock of heavy loads dropped into bowl. They flex and roll easily over rocks that might bruise or break smaller duals. There is no divided face where wedged-in rock fragments can wear and tear.

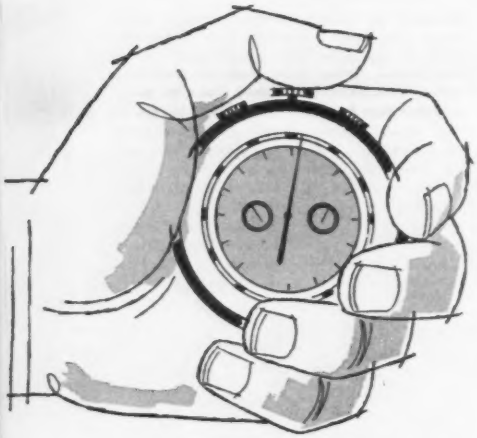
Write or phone your local L-W Distributor for more information on these big-production, low-cost Rear-Dumps. They are available in 11, 22, and 35-ton sizes.

R-1871-MQ-1

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



SECONDS SAVED

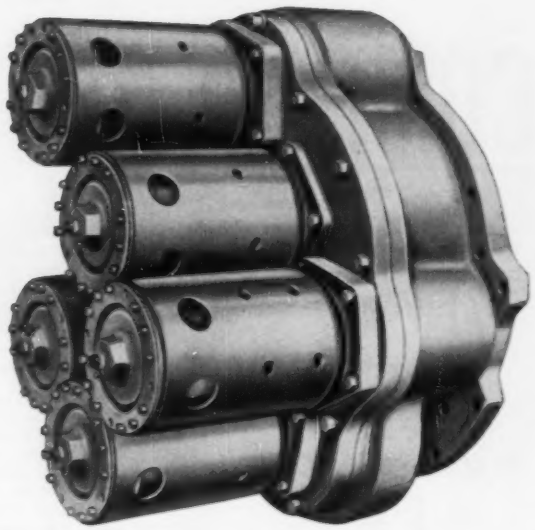
add up fast to give you ...bigger production ...bigger profits

Power-shift transmission on L-W Tournatractor® saves shifting time

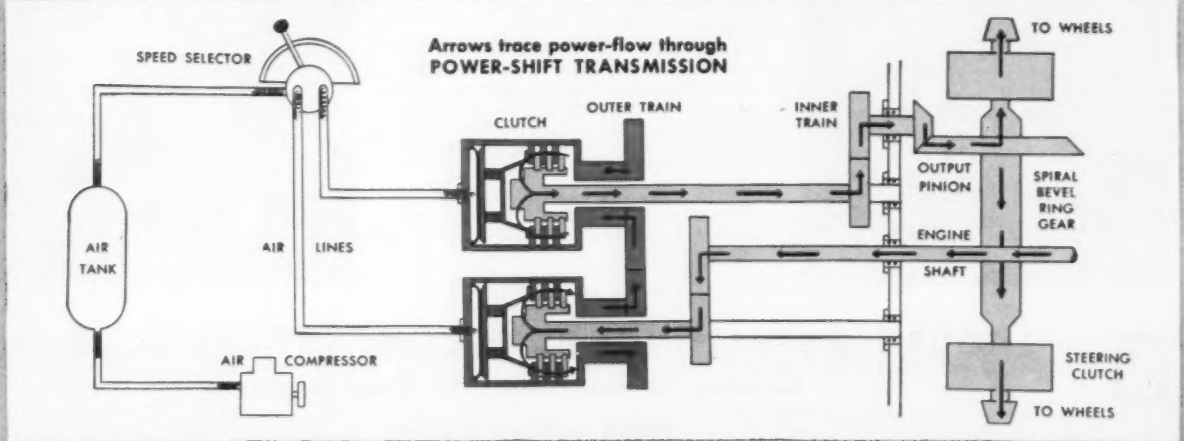
You can save as much as 80 minutes per 10-hr. day in your pit-tractor operations with instant shifting provided by Tournatractor's power-shift transmission.

This transmission is operated by air clutches for fast, efficient gear changes. Mounted individually on the ends of the gear shafts, the clutches engage and release in proper combinations through the operation of a simple selector lever. It requires little operator effort.

LeTourneau-Westinghouse power-shift transmission gives you non-stop, instantaneous speed-selection and high reverse speeds. There is no need to depress a clutch foot-pedal . . . no double-clutching . . . no meshing of one gear against another. With quick movement of the small speed selector, operator transfers power instantly from one gear ratio to another . . . with no gear clashing, no chance of locking out-of-gear. It gives faster pickup for drifting a load when dozing, and for pushing or pulling . . . gets more work done in less time!



Air-actuated transmission clutches save seconds — increase production. Each of the five 7" multiple-disc clutches in L-W Tournatractor transmission has 290 square inches of positive gripping surface. These heavy-duty clutches engage and release in proper combinations at the touch of a control lever. To make clutch adjustments, all you do is loosen a few Allen-head screws and turn adjusting ring "in" or "out." Transmission gears are fully enclosed and operate in a bath of oil. Lubrication points are conveniently located for quick, easy accessibility.



Torque converter saves seconds thru faster, more efficient operation

With Tournatractor's highly efficient single stage torque converter you get the equivalent of an infinite number of gear ratios within any gear range. It insures effective application of maximum horsepower at all times, over the complete speed range from 0.0 to 17.2 mph.

The LeTourneau-Westinghouse torque converter is a low-pressure unit, simple, and trouble-free. It has a single impeller, single turbine, and single reactor. Because it operates at low pressure, it is easy to keep the system sealed for lower maintenance.

Torque converter smooths out the shock of changing gears. It automatically balances load and torque, making gear selection less critical. Maximum efficiency is secured at all times by all of your operators. It automatically adjusts the speed ratio for more power, more speed, as needed. It provides you with better performance at all times in all your pit-tractor operations . . . dozing blasted rock on shovel clean-up, maintaining stockpiles, pushing gondolas, pulling other equipment, or maintaining haul-roads.

Ask for more information

To save seconds that add up fast for greater work-capacity and bigger profits, it will pay you to look further into Tournatractor. Write LeTourneau-Westinghouse Co., Box 240, Peoria, Illinois for free 32-page Tournatractor Bulletin. *Ask for a demonstration on your job.* See why this high-speed, rubber-tired tractor has faster acceleration, better maneuverability, lower maintenance, to give you the speed and mobility you need in your pit operation.

CT-1888-M-2

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

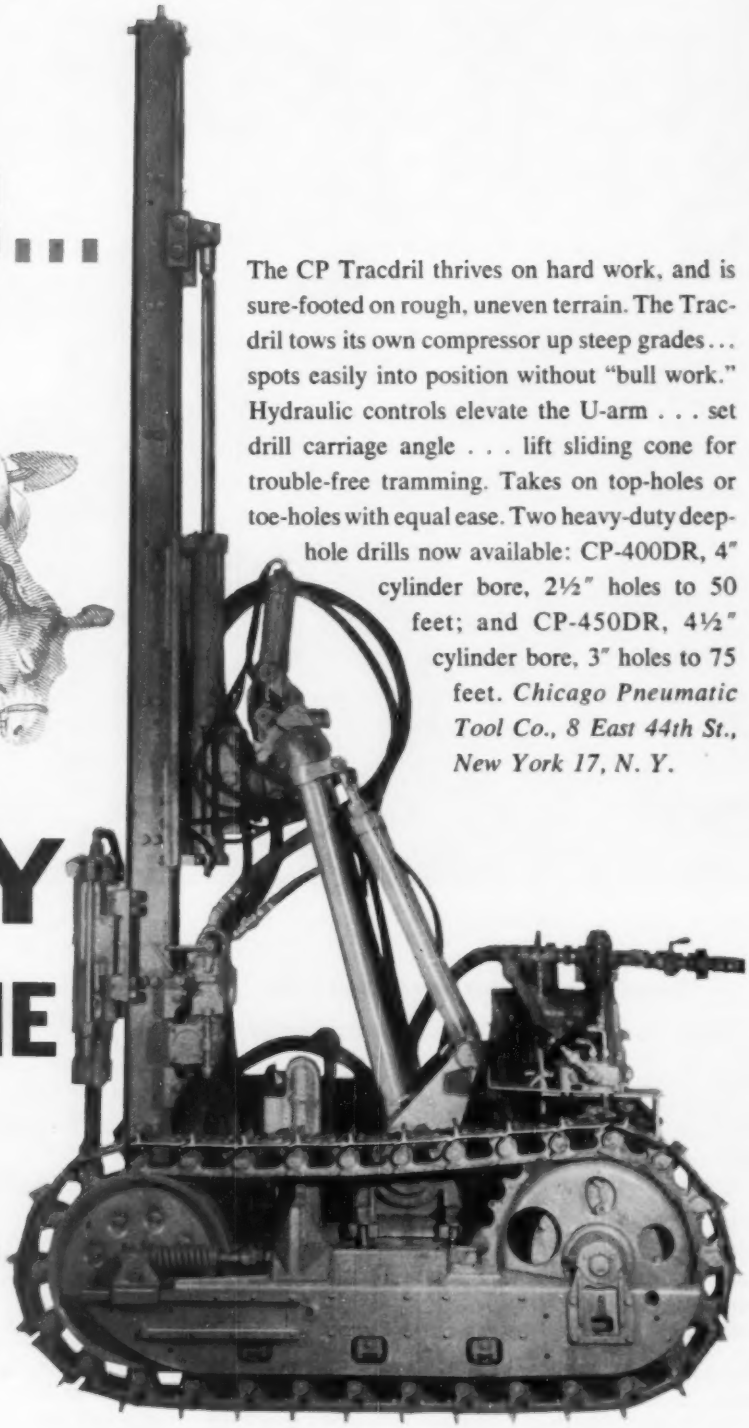
A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

Miner's best friends...

The CP Tracdril thrives on hard work, and is sure-footed on rough, uneven terrain. The Tracdril tows its own compressor up steep grades... spots easily into position without "bull work." Hydraulic controls elevate the U-arm . . . set drill carriage angle . . . lift sliding cone for trouble-free tramming. Takes on top-holes or toe-holes with equal ease. Two heavy-duty deep-hole drills now available: CP-400DR, 4" cylinder bore, 2½" holes to 50 feet; and CP-450DR, 4½" cylinder bore, 3" holes to 75 feet. *Chicago Pneumatic Tool Co., 8 East 44th St., New York 17, N. Y.*

TODAY IT'S THE CP TRACDRIL



Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

NOW! A REMOVABLE AIR-LEG BIT THAT'S ONE-PIECE STRONG

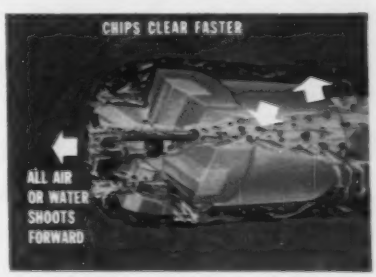
IT'S removable—yet the new Timken® tapered socket bit for air-leg drills is one-piece strong. With this tapered union, you get all the advantages of removability, and the strength of one-piece steel.

Removability of the new Timken tapered socket bit gives you all these advantages you can't get with intraset steels:

1) No need to throw away good drill steel when the carbides wear out. With intrasets you have to throw away good steels. 2) A pocketful of bits is enough for a day's work. You haul an armful of steel with intrasets. 3) You can change bit gauge sizes fast on the same steel. Using intrasets, you have to change the whole steel. 4) You carry only the bit to the shop for resharpening. With intrasets you lug the whole steel. 5) You get longer gauge wear because there are four carbide cutting edges. Most intrasets have only two.

The new Timken tapered bit's new frontal design features clear chips faster (right). And you get superior wear-resistance with added shock-resistance because of new special-analysis carbide inserts. They can be reconditioned many times.

To get removability *plus* strength, get the new Timken tapered bit. For free brochure, write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".



CHIPS CLEAR FASTER because 1) five front holes shoot water or air directly against the rock face and 2) deeper, wider wing clearance lets chips wash back faster.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

AVAILABLE NOW!

THE AIR-LEG BIT OF THE FUTURE

By depth-controlled, straight-forward

New kind of rubber builds new cut-resistance, longer wear into every off-the-highway tire!

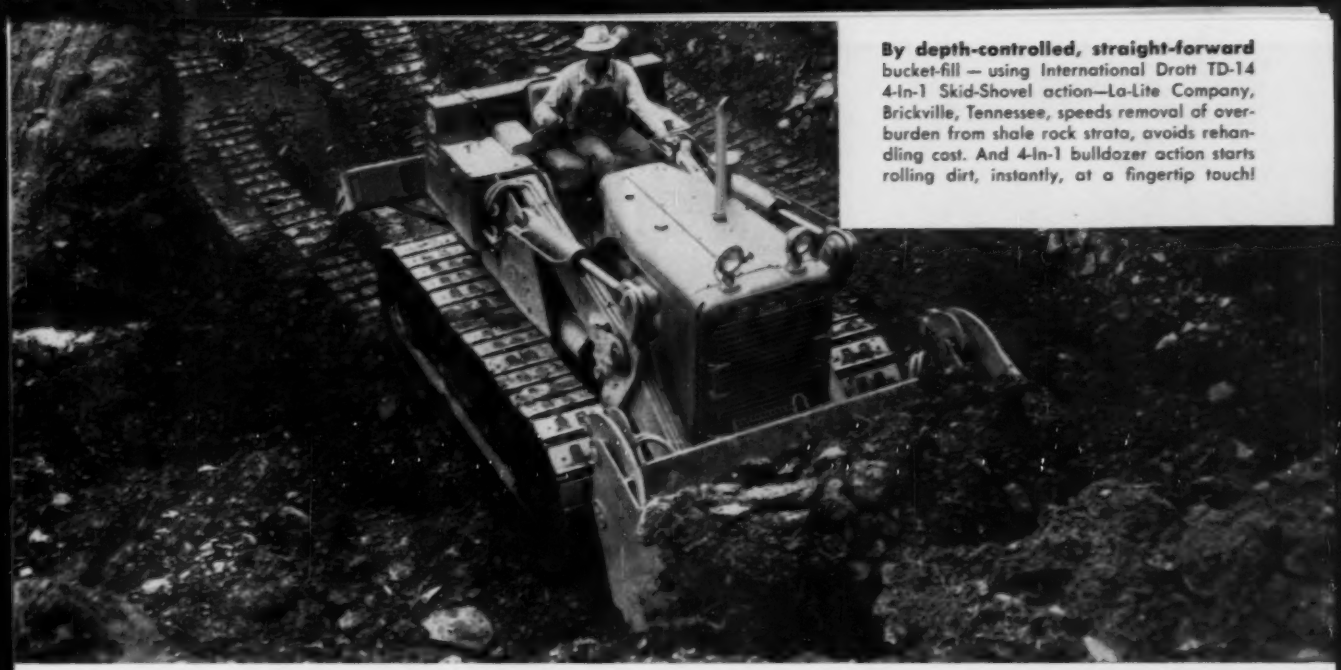
Tires built with Firestone Rubber-X defy slugging impacts and ax-edged snags to lower equipment down-time as no other tire material can. Combined with Firestone S/F (Shock-Fortified) Nylon, Firestone Rubber-X literally armors tires against costly impact damage. Built into a special tread design, this new rubber delivers new pull power for the worst bed or road conditions. You'll find Firestone Rubber-X off-the-highway tires outwork and outwear any other tires made! Ask your Firestone Tire Expert about these *tubed* or *tubeless* off-the-highway tires made with Firestone S/F (Shock-Fortified) Nylon and Firestone Rubber-X. *They're available at no extra cost.*

Firestone

BETTER RUBBER FROM START TO FINISH

Copyright 1958, The Firestone Tire & Rubber Company

RIB EXCAVATOR® ROCK GRIP EXCAVATOR® ALL TRACTION® LOGGER



By depth-controlled, straight-forward bucket-fill — using International Drott TD-14 4-In-1 Skid-Shovel action—La-Lite Company, Brickville, Tennessee, speeds removal of overburden from shale rock strata, avoids rehandling cost. And 4-In-1 bulldozer action starts rolling dirt, instantly, at a fingertip touch!

TD-14 4-in-1 uncovers, scarifies, stockpiles and loads shale efficiently

...for Tennessee Aggregate Producer

Shale-shattering action with the International Drott Scarifier attachment saves La-Lite Company the cost of breaking-up shale deposits by drilling. The third valve, standard equipment on all International Drott outfits, provides scarifier control power.

In addition to the actions shown, the 4-In-1 also gives instantly-available, big-capacity clamshell, and carry-type scraper performance. Prove what it means to get 4-machine utility for one moderate price. Ask your International Drott Distributor for a 4-In-1 demonstration!

Takes only one minute for the TD-14 to heap-load a 6-ton truck with shale—which La-Lite Company wholesales as aggregate to building block manufacturers. Versatile performance has enabled the 4-In-1 to replace a ¾-yard shovel on this owner's operation!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL® DROTT®

Send for free catalog today

Gentlemen: My material handling operation consists of (please name): _____

_____

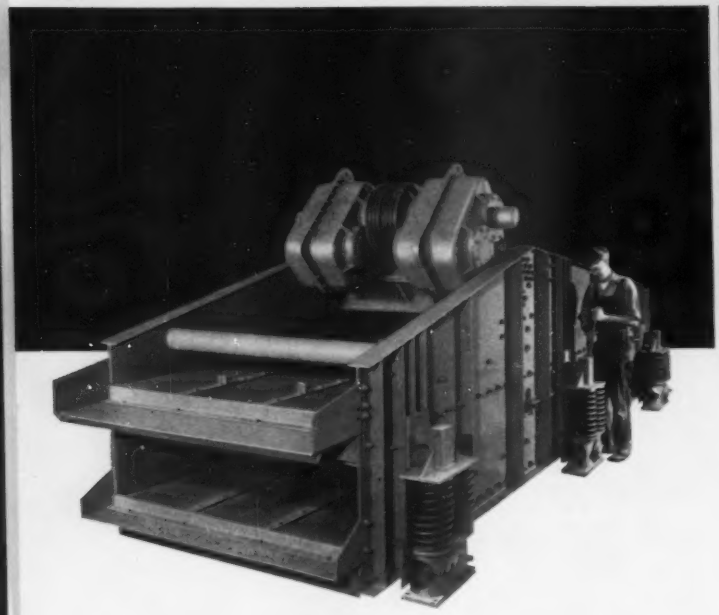
Please send 4-In-1 catalog literature checked:

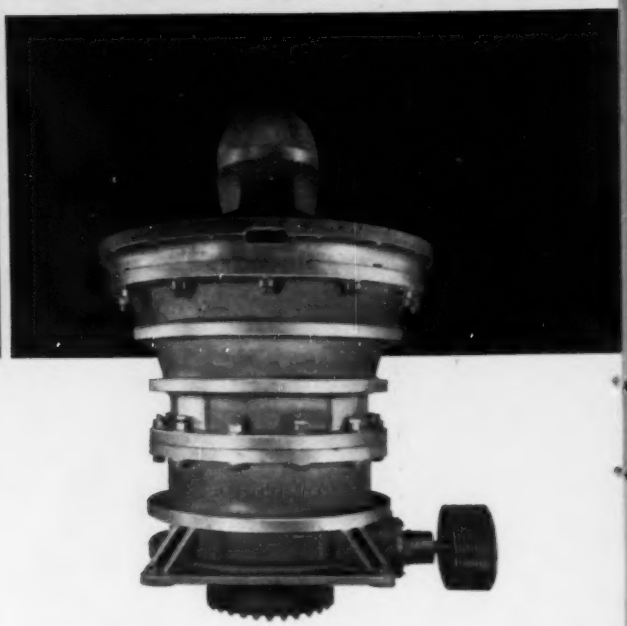
☐ 1-yd TD-6 (CR-612G) ☐ 1½-yd TD-9 (CR-648G) ☐ 2¼-yd TD-14 (CR-642G)

Name _____

City _____ State _____

Street or R.F.D. _____





Equipment and facilities coordinated to solve application problems

. . . that's "Coordineering" at Allis-Chalmers

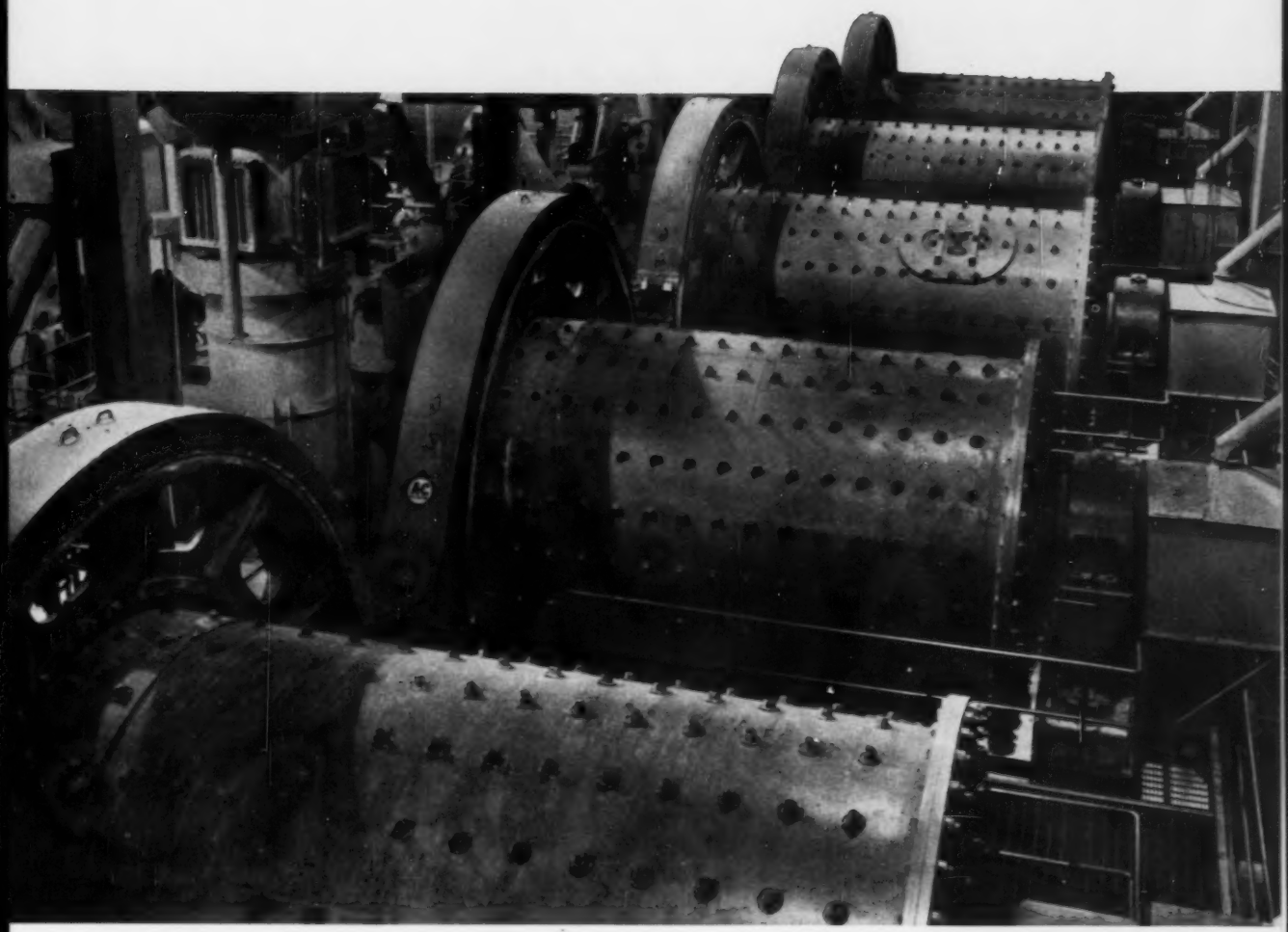
"Coordineering" evolved from Allis-Chalmers vast experience (more than 100 years) in designing and applying major processing equipment for mines and quarries throughout the world. Coordineering begins with the consideration of overall plant design, proceeds to correlated planning by product staffs and follows through to engineering details. It includes testing in industry's best equipped research and pilot plant facilities. It results in maximum plant efficiency and uniform product quality.

It will pay you to investigate our coordineering advantages in the early planning stages of your expansion or modernization program. An Allis-Chalmers technical team will gladly confer with you or your consultants. Call your local A-C representative, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

A-5660

ALLIS-CHALMERS

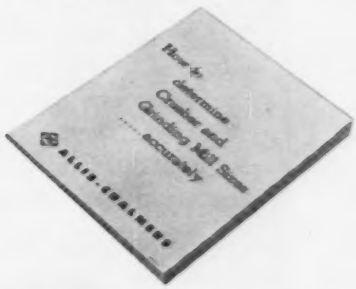


"Coordineered" Equipment for the Mining and Rock Products Industries

Grinding mills — Whether your process calls for individual mills or a grouped-stage grinding series, Allis-Chalmers can make a right-for-the-job recommendation from seven types of grinding mills.

Vibrating screens — Allis-Chalmers screens are built in single or multiple-deck models for use in scalping, wet or dry sizing, washing, rinsing, dewatering and media recovery.

Gyratory crushers — "One-man, one-minute" product control slashes time required to change crusher settings from hours to seconds. Size adjustment, compensation for mantle wear, and emergency unloading are done at the flip of a switch.



"Work Index" Formula

This bulletin explains the "work index" formula — and how you can evaluate any size reduction operation. Compare efficiency of plants, circuits and machines. It offers the only practical approach for improving performance or determining the right machine for a job. Write for Bulletin 07R7995.

Uncovering Pure White Kaolin Clay

One of the many uses for large-size Marion excavators is illustrated by this Type 7400 walking dragline which removes overburden averaging 62 feet in depth at a kaolin clay mine in Georgia. The big walker is equipped with a 220-foot boom and a 9-yard bucket. Kaolin clay is a vital ingredient in the products of the rubber, glass, paper and ceramics industries.

This 43-M maintains a steady flow of raw material for large Ohio brick and tile plant. Heavy-duty construction of the 1-yard shovel matches that of larger Marions. There's a machine in the extensive Marion line that's just right for your job, too.

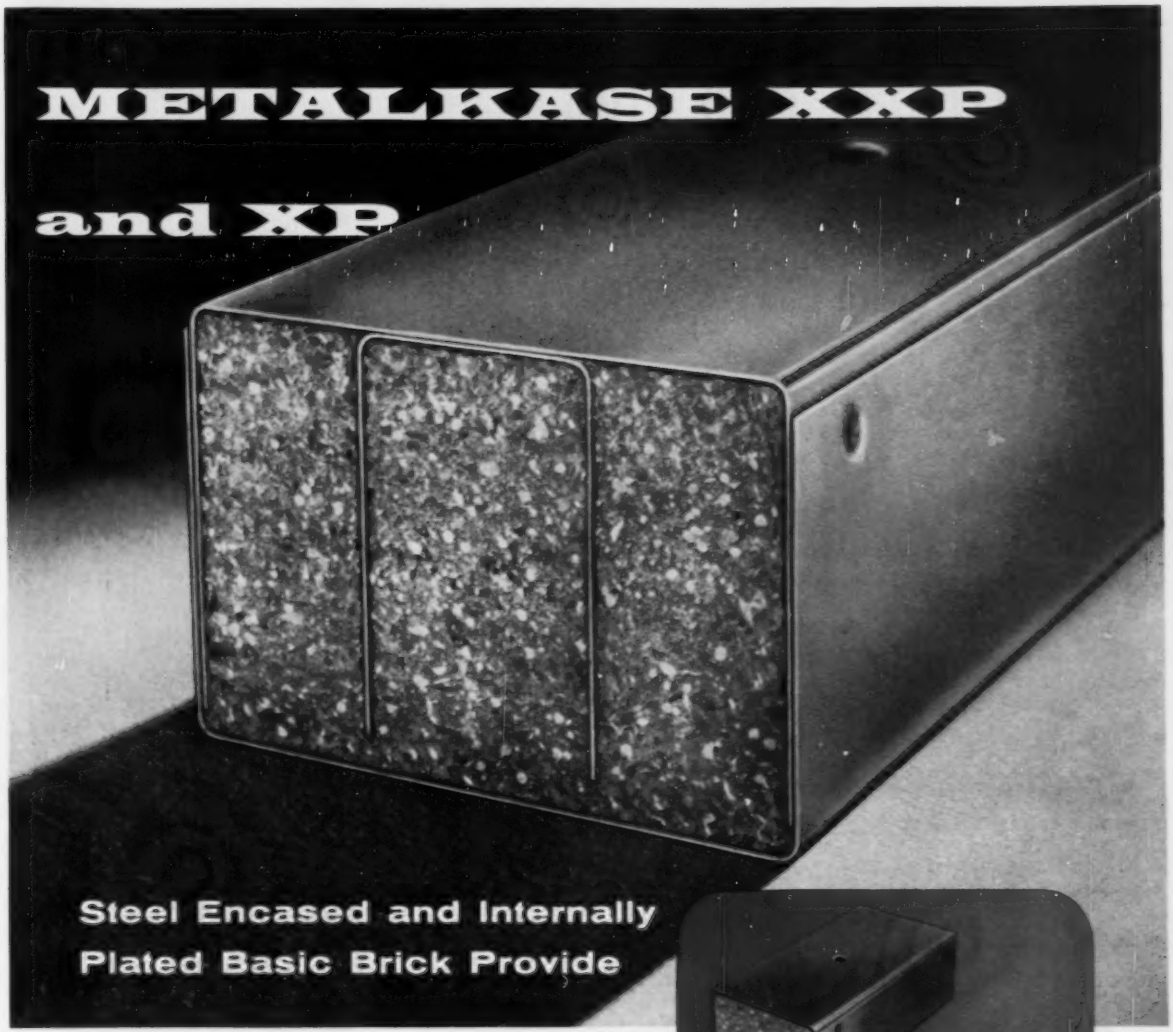
CONSULT MARION *MINING SPECIALISTS for lowest costs on your property!*

MARION POWER SHOVEL COMPANY—MARION, OHIO, U. S. A.

A Division of Universal Marion Corporation

HARBISON-WALKER

METALKASE XXP and XP



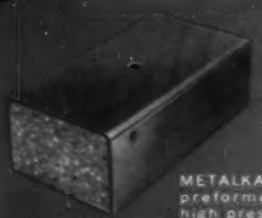
Steel Encased and Internally Plated Basic Brick Provide

- **greater spalling resistance**
- **reduced peeling tendency**

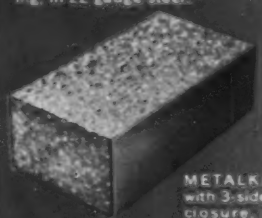
METALKASE XXP are chemically bonded basic brick with two internal plates, formed under high pressure, and are furnished in standard sizes, suspended arch and other shapes. They are available in various compositions. In the illustration the METALKASE XXP brick is cut to show the plated construction. These plates extend through the length of the brick.

METALKASE XP brick, having a single internal plate, are made in hard fired basic brick of various classes. They are available in standard sizes and many special shapes. These brick are used in various particular applications with great benefit.

Extensive use in both steel and various non-ferrous metallurgical furnaces clearly demonstrates the superior spalling resistance of the internally plated brick, and as the result of improved stress relief, appreciably reduced tendency to peel.



METALKASE brick, preformed under high pressure and encased on all four contact sides by welding, in 22 gauge steel.



METALKASE brick with 3-sided steel enclosure, especially suited for electric furnace side walls and other specific applications.

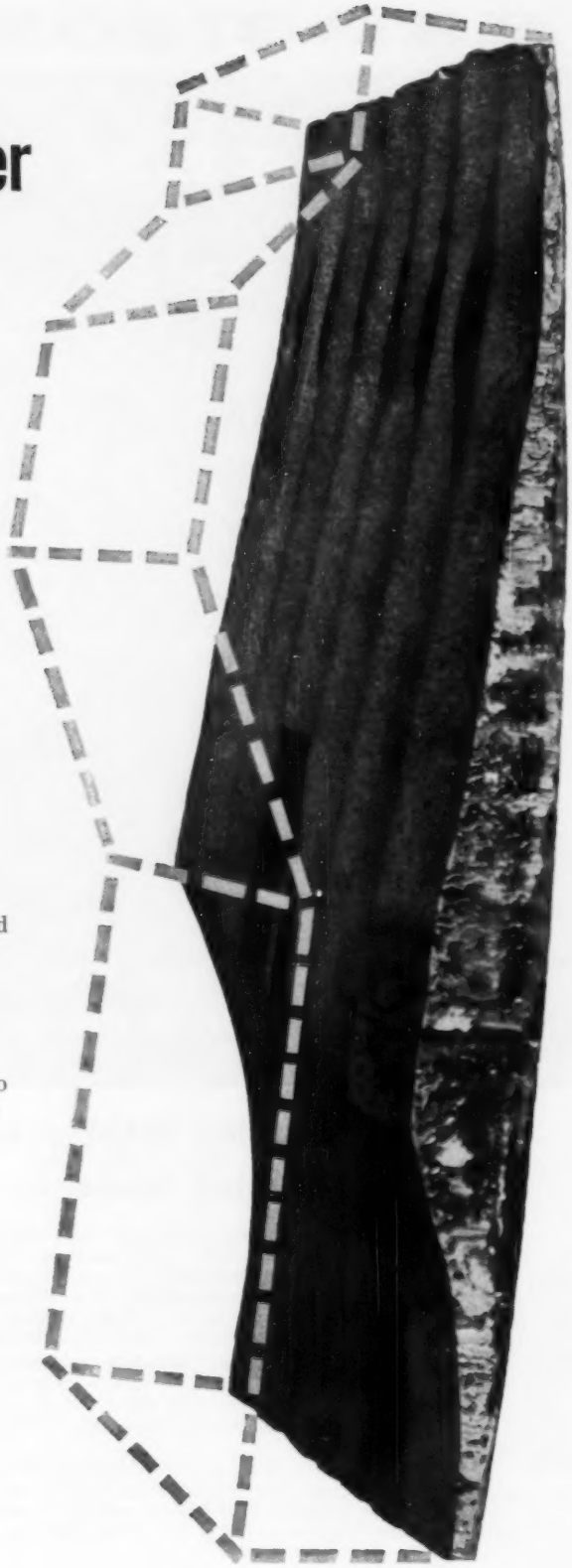
Other Metalkase designs

HARBISON-WALKER REFRACTORIES COMPANY
AND SUBSIDIARIES

GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

World's Most Complete Refractories Service

Ni-Hard ball mill liner grinds 600,000 tons of ore in 711 days



Performance like this – based on an actual case history – is the rule . . . not the exception.

Even under the toughest service conditions possible, Ni-Hard* nickel-chromium white cast iron liners last longer than any other liner material. With Ni-Hard liners you substantially increase the interval between relinings.

Ni-Hard — with its outstanding abrasion resistance is economical as well

With chill cast hardness above 600 Brinell, Ni-Hard liners provide excellent abrasion resistance and the longest service life available. Ultimate economy is measured by the cost of liner material worn away in grinding each ton of product.

If abrasion is costing you money, put Ni-Hard to work in your plant. Many of the authorized Ni-Hard foundries are regular producers of Ni-Hard liners as replacement parts for standard mills. Many manufacturers recommend Ni-Hard liners as original equipment for their mills.

For information on how you can take advantage of economy of Ni-Hard, drop a note to the address below. Technical information and a list of regular producers are available.

*Registered trademark

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N. Y.

No. 6 in a series

Right off the Wire

A computer-controller system is said to be capable of landing 120 jet planes per hour. Human control can average no better than 40 per hour.

Dockside facilities at SIMPLEX' Submarine Cable Division in Newington, N. H. are extensive enough to continuously load two of the largest submarine cable ships simultaneously.

A new plant is reported to cut the manufacturing time of industrial carbon components from eight weeks to eight minutes.

A "building block" technique, using miniature plug-in units, makes it possible to build an electronic computer small enough to go on an office desk.

An iron-aluminum alloy has been made, the behavior of which indicates that there is a relationship between rusting and magnetism.

Some fruit trees have been found to ripen earlier after long exposure to gamma radiation.

At least one of the new "exotic" rocket fuels is being made in solid form and others are expected soon.

A patent has been issued for a radioactive "go-devil" (a device for cleaning pipe lines). If it sticks in a pipe it can be located with a Geiger counter.

It is estimated that malicious damage to street lamps costs New York City a quarter of a million dollars a year. A new plexiglas globe makes this sort of vandalism almost impossible.

Instead of the usual bracing and shoring, inflatable cushions are being used to wedge freight tightly in box cars.

One of the new guided missiles is launched from an automatic base which computes the location of the attacking object, calculates its speed and the proper point for meeting it. It also loads and fires the missile automatically.

A micro-porous synthetic material holds a liquid, such as an ink or lubricant, and gives it off at a controlled rate.

Damage to small delicate parts on a conveyor can be avoided by a new belt that uses permanent magnets to hold the pieces apart.

Glass-reinforced plastics can be strengthened by the use of a special new glass containing copper oxide.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

A new wool-like synthetic fiber is water-repellent, quick-drying and less expensive than other synthetics.

A device for measuring the power output of a turbine involves an inner and an outer gear in constant mesh with free space between the teeth. This space is filled with oil on which the pressure can be measured.

Simplex Wire & Cable Co. was the first to adapt interlocked armor (CONDEX) for use with underground cable in 1924.

A logging company is using plastic nails to fasten logs together. They neither rust nor damage saw blades.

Paralyzed fingers can be made to move by means of tiny artificial muscles powered by a carbon dioxide cartridge.

Research conducted by two Simplex scientists in the early 1920's resulted in the first truly moisture-resistant rubber insulation. The isolation and removal of the proteins that are always present in natural rubber was the basis of the now famous ANHYDREX family of insulations.

Foamed aluminum is being made for use as a core in sandwich construction.

An electronic device checks the accuracy of aircraft guns without firing them.

Rooftop Laboratory

These cable samples, twisted and bent to exert maximum stress on insulations and jackets, are undergoing sun-crack endurance tests atop the Simplex plant at Cambridge. Many of these samples have been exposed to the elements for as long as fifteen years . . . and they haven't cracked yet. This is one example of the many punishing tests which Simplex insulating and jacketing compounds, such as Anhydrex, Thermoplex and polyethylene, are subjected to before they win final approval.

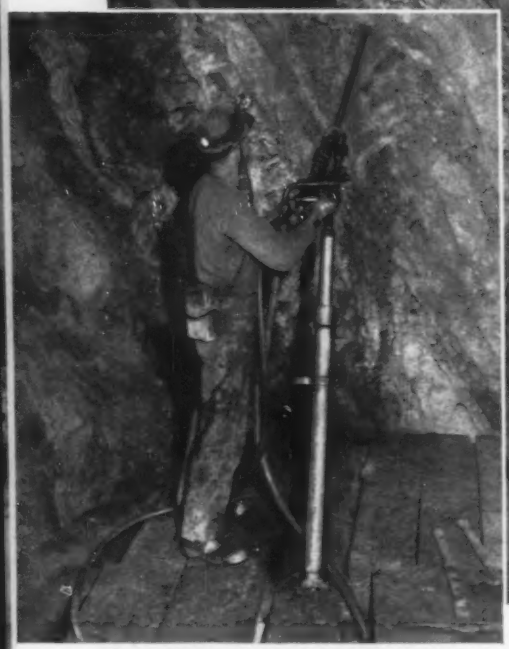
It's all part of a comprehensive system of quality control which has helped make Simplex the leader in cable research and manufacture.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

"The American manufacturers of transoceanic telephone cables"



H10AL Air Leg takes the hard work out of drilling —absorbs shock, advances the drill into the rock.

Operator can quickly and easily change position for bolting. Air Leg keeps drill in line with hole — reduces drill wear.

One Tool Handles Both Production and Rock Bolting

Le Roi H10AL Air Leg does double duty in typical stoping operation.

Recent design changes reduce wear, ease dismantling

Le Roi's H10AL Air Leg is shown here doing two jobs in a sphalerite stoping operation. Down at the 1900-foot level in a Montana mine, the operator uses both 6- and 11-foot steels while stoping. He makes an 11-foot advance per round in this horizontal breast cut and hydraulic fill stope.

After each blast, he scrapes and bolts the rock walls before drilling the next round. He doesn't need an extra tool. He merely changes the direction of his H10AL Air Leg to quickly and easily handle the rock bolting operation, too.

You can use Le Roi Air Legs as stopers, drifters, or sinkers. They have a full range of drill rotations. An exclusive 11-position feed control allows you to set and maintain any desired feed pressure from 9 psi to full line pressure. That makes it easy to keep lined-up with the hole — reduces front-end wear, eliminates rotation strain — keeps your drill-repair costs down.

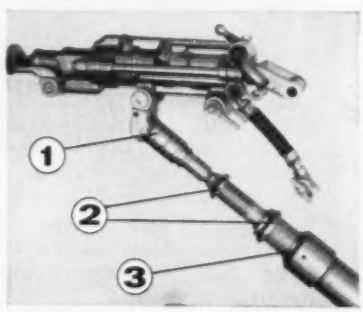
There's no third hose or clumsy "Y" connection. And the Air Leg absorbs the drill recoil. That means an easily handled rig — one that won't tire out the operator, lets him get in plenty of footage with less fatigue.

New Improvements

A sturdy ball-lock connection between drill and Air Leg on recent models permits quick dismantling for easy transportation. This unit is sealed against dirt, and is far stronger than the old bayonet-style construction.

Umbrella drip shields over both pistons keep out unwanted dirt and sludge. Bleed air at both pistons will carry oil to the cup leathers and also prevent dirt from entering the working parts at bushing and piston points. Other mechanical changes and improved metallurgy reduce wear from vibration throughout the entire feeding cycle.

You can choose from several types of Le Roi Air Legs having single or telescopic 3, 4, 5, or 6 ft. feeds. Conversion kits are available to convert older models to the new Le Roi design. Write today for complete information on this useful tool.



(1) Ball lock connection, (2) umbrella drip-shields, (3) sealed dirt-free construction.

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Newmatic air tools, Tractair,® portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

WABCO

CYANAMID

REAGENT NEWS

"ore-dressing ideas you can use"

AEROSOL® OT *Surface Active Agent Cures "Sticky Froth" Problem in Sphalerite Flotation*

A zinc mill in the eastern United States had a very unusual operation problem in the flotation section.

Lowest cost-plus-tails were achieved by a reagent combination comprising 0.7 lb/ton SODIUM AEROFLOAT® Promoter and 0.1 lb/ton AEROFROTH® 77 Frother with 0.5 to 0.75 lb/ton $CuSO_4$ as a zinc activator and 0.03 lb/ton NaCN plus 0.6 to 0.9 lb/ton of lime as pyrite depressants. Flotation froth, however, was "sticky", voluminous and difficult to control. Reagent combinations which produced more controllable froth were less efficient.

A Cyanamid Field Engineer diagnosed the difficulty as the possible result of a reaction between the $CuSO_4$, soluble salts and interfering slimes in the flotation feed which had a stabilizing effect on the froth. Laboratory tests showed that adding only 0.10 lb/ton of AEROSOL OT-75% Surface Active Agent controlled the slimes and produced a small-bubble, easy-to-control shallow froth.

AEROSOL OT is available both as a solid and as a 75%-solids aqueous paste which is easy to handle and dissolve. Write for our bulletin on the AEROSOL Surface Active Agents for further information on this and other AEROSOL products.

* * * * *

In their constant world-wide contacts with every type of precious and base metal operation, Cyanamid Field Engineers accumulate a vast amount of reagent application knowledge which is available to present and prospective users of Cyanamid Reagents in the solution of difficult beneficiation problems. Feel free to call upon us for technical help as well as your reagent needs.

AMERICAN CYANAMID COMPANY
EXPLOSIVES AND MINING CHEMICALS DEPARTMENT

CYANAMID INTERNATIONAL—*Mining Chemicals Department*
Cable Address:—Cyanamid, New York

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

CYANAMID OF CANADA LIMITED
160 Bloor Street East,
Toronto 1, Ontario, Canada

CYANAMID DE MEXICO, S.A.
Apartado Postal 283
Mexico 1, D.F., Mexico

CYANAMID OF GREAT BRITAIN LTD.
Bush House, Aldwych, London W. C. 2, England

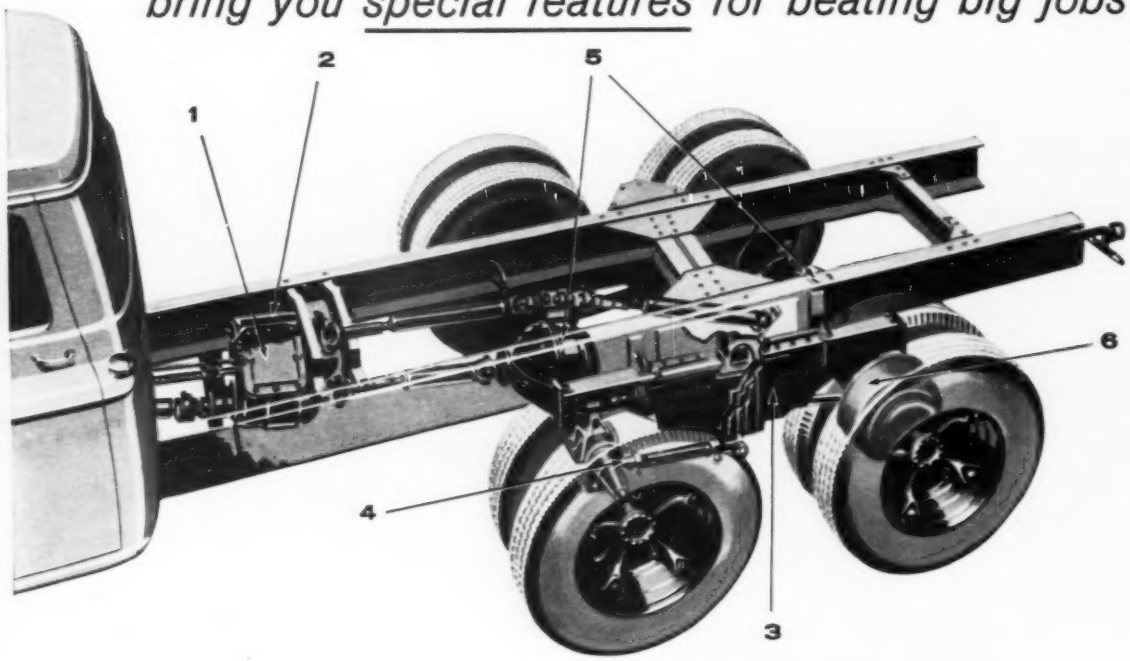
SOUTH AFRICAN CYANAMID (PTY.) LTD.
P. O. Box 7252,
Johannesburg, Union of South Africa

E. P. CADWELL
Belen 1043, Of. 6, Lima, Peru

CYANAMID AUSTRALIA PTY. LTD.
"Collins Gate"
277 Little Collins Street
Melbourne, Australia

CHEVROLET'S NEW TANDEMS

bring you special features for beating big jobs!



Because of their unique features, Chevrolet's new Triple-Torque tandems are more economical to operate. They're designed to bull their way through the tough spots with tremendous traction . . . with less stress and wear on parts!

Here are some of the design advantages that make Chevrolet tandems tops on big, tough jobs:

1. Chevrolet's exclusive TRIPLE-TORQUE DRIVE is provided by individual propeller shafts driven from a 3-speed auxiliary transmission right in the power divider.

2. Integral 3-SPEED POWER DIVIDER can be shifted instantly to single axle drive for economy or dual axle drive for full traction over rugged roads.

3. The Triple-Torque tandem's articulated WALKING BEAM assures owners of greater ground clearance . . . the utmost flexibility for operation on rough terrain.

4. "TRACKING" WHEELS, because of Chevrolet's rubber-bushed steering torque rods and walking beam ends, stay in alignment on straight roads, follow curves. Increase tire life, driver control.

5. Two built-for-work 15,000-LB.-CAPACITY AXLES with 7.20 to 1 ratios! Choice of standard 7,000-lb. or extra-cost 9,000-lb.-capacity front axle.

6. BIG TWIN-ACTION BRAKES are designed to last! Extra braking power with heavy-duty Hydrovac power brake. Full-Air or Air-Hydraulic brakes optional at extra cost.

Let your Chevrolet dealer show you these, and the many more exclusive tandem features designed to get your big jobs done quickly, dependably and economically! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET CHEVROLET TASK·FORCE TRUCKS

product:

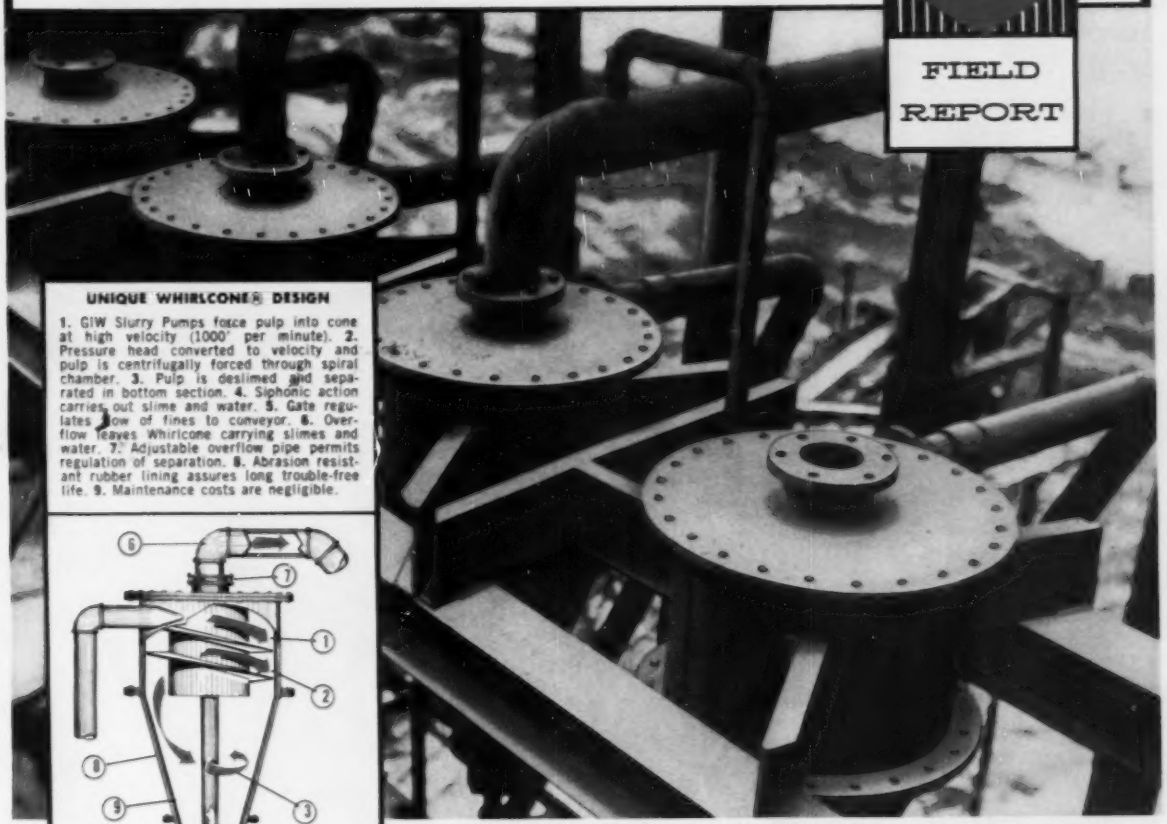
COTTRELL WHIRLCONE® SEPARATORS

customer:

BECKER COUNTY SAND & GRAVEL CO.

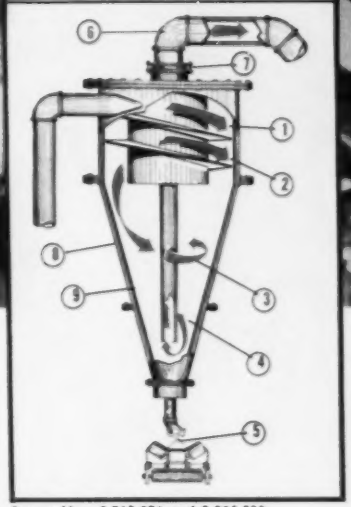
GIW

FIELD REPORT



UNIQUE WHIRLCONE® DESIGN

1. GIW Slurry Pumps force pulp into cone at high velocity (1000' per minute). 2. Pressure head converted to velocity and pulp is centrifugally forced through spiral chamber. 3. Pulp is deslimed and separated in bottom section. 4. Siphonic action carries out slime and water. 5. Gate regulates flow of fines to conveyor. 6. Overflow leaves Whirlcone carrying slimes and water. 7. Adjustable overflow pipe permits regulation of separation. 8. Abrasion resistant rubber lining assures long trouble-free life. 9. Maintenance costs are negligible.



Patent Nos. 2,738,070 and 2,806,599

Tough GIW Slurry Pumps feed pulp to these 25" dia. Whirlcones®, which retain fines from classifier overflow. Maximum recovery rate is 20 tons per hour per cyclone. The cones will handle material from −12 mesh to lightest slime.

Whirlcone® Separators solve difficult fine recovery problems.

The retention of fines in the −50 plus 200 mesh range posed a disturbing problem for the Becker County Sand & Gravel Co., of Cheraw, S.C., primarily because the large amount of water used in processing the sand and gravel washed out the desirable fines with the minus 200 slimes.

Fourteen 25" dia. Whirlcone® wet type cyclones installed parallel in four Becker plants solved this problem completely. Operating an average of 8 hours daily, they extract up to 100 tons of clean, fine sand per hour from wash water while the minus 200 mesh slime is discarded.

Recovered fines are used to bring sand up to specifications. Thousands of tons of valuable sand, formerly lost, soon paid for the low cost of the Whirlcones®.

GIW's highly efficient Whirlcones® are also being used in the mining fields to deslime, degrit, classify, concentrate, make dam and mine backfill and to dewater or thicken where the overflow can be returned to the process or it can be discarded.

They are available in diameters from 6" to 50". Capital cost including the pump is 20 to 50% of conventional classifiers.

If you are losing fines from material −12 mesh to lightest slimes, write today. Recommendations and literature will be forwarded promptly.

COTTRELL ENGINEERING
Division of
GEORGIA IRON WORKS CO.

GIW

Manufacturers of pumps, dredges, separators and accessories.

AUGUSTA • GEORGIA

KOEHRING WORK CAPACITY *in action* . . .

A new 2-yard — Latest addition to the big Koehring line of excavators for mining and quarrying is this new 805. It's a heavy-duty 2-yard machine, with 25-foot deep-section shovel boom, and 18½-foot dual dipper sticks. You'll like the 805's power, strength, stability in heavy digging — and *extra capacity* as a dragline or crane for stripping, stockpiling, lifting. It handles 2 to 3-yard dragline bucket — lifts up to 52 tons.

"Diving" for gravel — Loading out of a water-filled gravel pit (right), this 405 dragline puts production on a big-tonnage basis. It has plenty of work-radius for this type of operation — can be used with 40 to 90 feet of boom, and handles 1 to 1½ cu. yd. bucket depending on weight of materials. Check its other work capacities on opposite page, then let your Koehring distributor show you what the 405 will do for you.

Re-working a slag bank — Once cast aside as waste, slag is now being reclaimed from this bank, run through a crusher, and used as sub-base material on road construction. During the process, slag is swept by a magnet to remove any scrap metal. Here, a Koehring 1½-yard 605 shovel loads the slag into Dumptors for haul to crushing plant. This combination of Koehring shovels and Dumptors makes a heavy-duty, high-production team. 6-yard Dumptor® climbs 24% grades fully loaded, dumps in one second, travels at same high speeds in either direction — no need to turn.

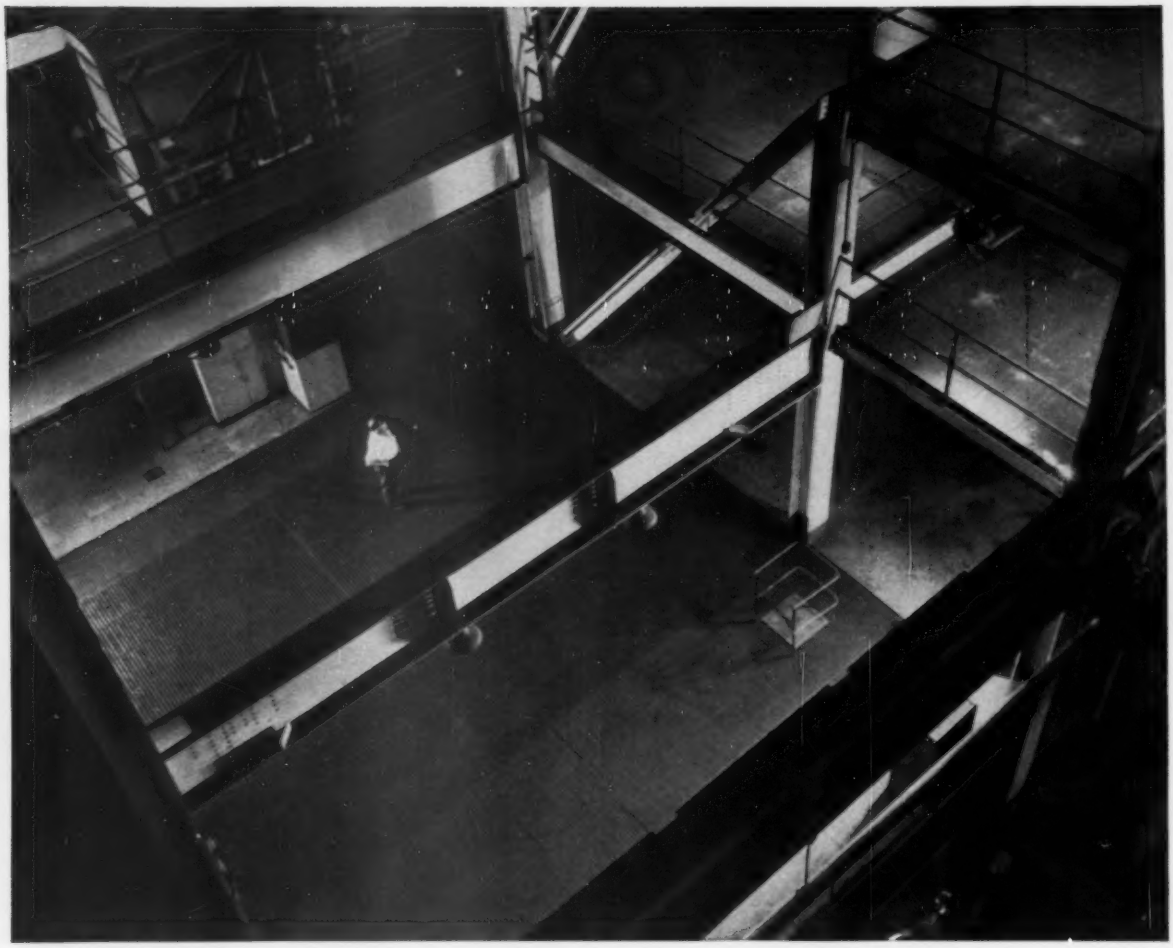
Mining copper ore — At this open-pit mine in the Southwest, overburden has been stripped down to pay-dirt. Next, a Koehring ½-yard 205 loads out copper-bearing ore for haul to smelter. Powerful crowd, fast retract, smooth swing, and instant dipper-trip speed production in the pit, keep trucks on the run.

Here are some figures that will interest you:

KOEHRING MODEL	SIZE DIPPER	LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load.)	
205 CRAWLER	½-Yd.	20,000 lbs.	at 10-ft. radius
205 ON RUBBER	½-Yd.	30,000 lbs.	at 12-ft. radius
305 CRAWLER	¾-Yd.	30,000 lbs.	at 12-ft. radius
305 ON RUBBER	¾-Yd.	50,000 lbs.	at 10-ft. radius
405 CRAWLER	1-Yd.	40,000 lbs.	at 12-ft. radius
445 ON RUBBER	(Crane only)	90,000 lbs.	at 15 ft. radius
605 CRAWLER	1½-Yds.	72,200 lbs.	at 12-ft. radius
805 CRAWLER	2-Yds.	104,200 lbs.	at 12-ft. radius
1205 CRAWLER	3-Yds.	190,000 lbs.	at 12-ft. radius

Want more information? See Koehring distributor.

KOEHRING DIVISION OF KOEHRING COMPANY, Milwaukee 16, Wis.



Blaw-Knox Electroforged® Steel Grating provides removable floors to simplify plant operation

Floors and mezzanines made of Blaw-Knox grating solve the problem of reaching, moving and servicing the largest types of equipment. Sections come up easily, allowing ample space to maneuver and maintain any size of machinery. Costly, time-consuming alterations are virtually eliminated.

For increased plant safety Blaw-Knox Electroforged Steel Grating provides rigid one-piece construction for sure support of the heavy loads. Non-slip cross bars and a wide variety of bearing bars assure safe walking and climbing — even under the most hazardous working conditions.

Because there's nothing to wear, or patch, nothing to catch and retain dirt, upkeep becomes easy and economical. And grating's maximum open area admits more air and light, makes brighter, better-ventilated plants.

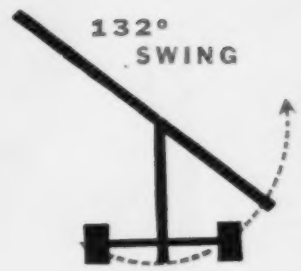
Blaw-Knox Electroforged Steel Grating for walkways, stair treads and floors is fabricated to meet your specific operating needs. For new ideas about a complete line of space saving grating, write for Bulletin 2527 featuring grating and treads.

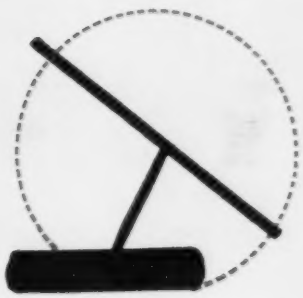
BLAW-KNOX

BLAW-KNOX COMPANY

Equipment Division
Dept. S, Pittsburgh 38, Pennsylvania

AT CONSUMERS COMPANY'S QUARRY





Sit down . . . move in . . . drill . . . drive on with Gardner-Denver Deluxe "Air Trac"

. . . everything you need for fast, effortless blast hole drilling is at your finger tips. Centralized hydraulic remote controls give instantaneous command of all operations. You can swing, lift and lower drilling mast into position . . . drill . . . and drive crawler tracks without getting off the rig.

Gardner-Denver DPAT hydraulic drill positioner provides 132° swing, 360° dump. You'll have an 86° T-bar lift. All vertical, horizontal and flat lifter holes can be completeiy power-positioned. The hydraulic system is creep-free, maintains alignment at all drilling angles, avoids stuck steel.

Deluxe "Air Trac"® is equipped with hard-hitting, fast-acting DH123 (4½") or DH99 (4") drill . . . free-wheeling drive shaft for towing . . . toolbox for tool, bit and coupler storage. Climb aboard and test the Deluxe "Air Trac" at your nearest Gardner-Denver distributor's today.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
Export Division, 233 Broadway, New York 7, New York
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

AT CONSUMERS COMPANY'S QUARRY

P&H ELECTRICS PROVE

In the 100-ft. deep mammoth Consumers Company limestone quarry in McCook, Illinois, this 5 cu. yd. P&H Electric Shovel is proving to be a vital link in the production of crushed stone. This P&H Model 1500 loads a steady stream of 15-ton trucks to keep crushers operating 'round-the-clock.

This maximum availability coupled with a minimum of maintenance is typical of P&H performance in important mines and quarries throughout the world. That's why leading operators are choosing P&H Electrics for both new installations and replacements.

Comparison tests have proved that two exclusive P&H features pay off in *continuous profitable production:*

MAGNETORQUE,® the electro-magnetic type coupling that transmits power from hoist motor to dipper for faster action, greatly reducing shock and impact to the hoist gear train and motor.

ELECTRONIC CONTROLS, the fastest acting type of control available on electric shovels, providing the smoothest, quickest production cycle known.

With P&H you get single source responsibility . . . another distinct advantage experienced only by users of P&H Electric Shovels. P&H designs, manufactures and applies all electric rotating equipment specifically for electric shovel service.

P&H ELECTRIC SHOVEL LINE: 3½ through 10 cu. yd. capacities

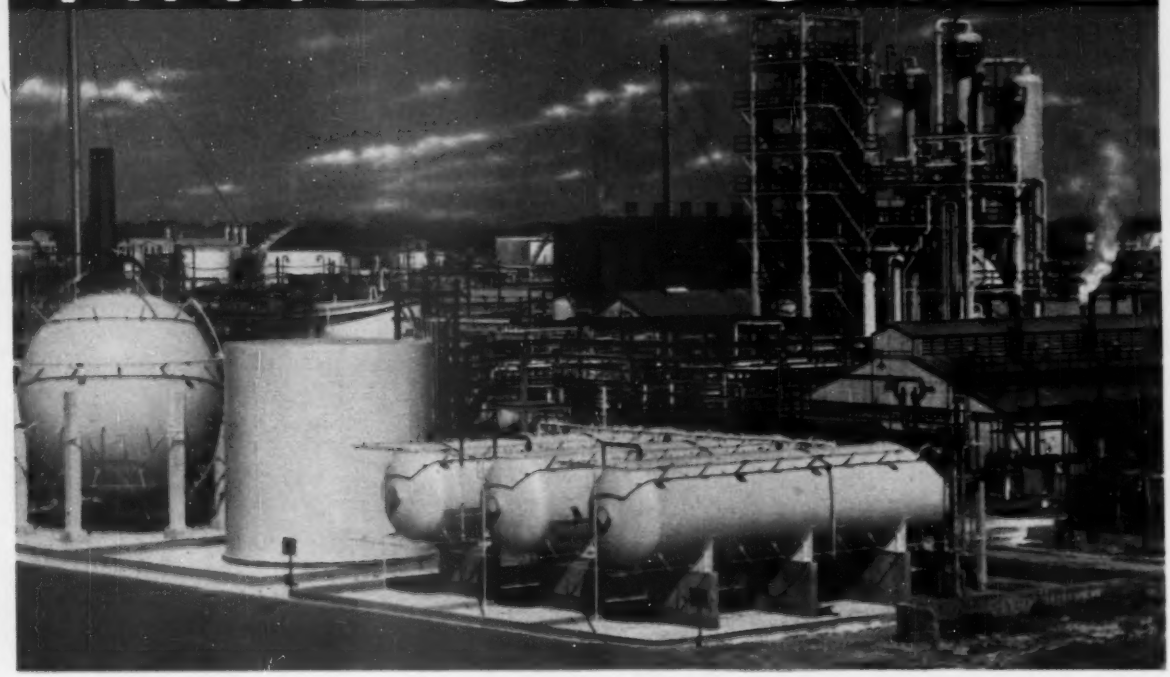
HARNISCHFEGER

Construction & Mining Division
Milwaukee 46, Wisconsin

THEIR RUGGEDNESS IN ROCK

Ethyl Corporation

VINYL CHLORIDE



plant engineered
and constructed by

CATALYTIC

Ethyl Corporation selected CATALYTIC for the engineering, procurement, and construction of its new Vinyl Chloride Plant. Close cooperation and coordination between Ethyl and CATALYTIC, utilizing to the fullest their joint experience with chlorinated hydrocarbons, resulted in successful on-stream operation of this plant within the scheduled completion time and budget.

CATALYTIC Construction Company

Philadelphia 2, Pennsylvania
Baton Rouge, Louisiana
Toledo, Ohio
Tulsa, Oklahoma

In Canada: Catalytic Construction of Canada, Limited; Sarnia, Ontario; Toronto, Ontario; Montreal, Quebec

Catalytic *On-Time*... *On-Budget* Services

for the metallurgical, chemical, petrochemical and oil refining industries: Project Analysis; Process Development; Process Design; Economic Studies; Engineering; Procurement; Construction.

Yes!...it's ALL STEEL

HP RANGE:
½ to 50 hp

RATIOS:
4:1—14:1—24:1 (or 20:1)

OUTPUT SPEED RANGE:
420 to 5 rpm

TORQUE RATINGS:
up to 31,500 lb-in

FALK
ALL STEEL
Shaft Mounted Drive

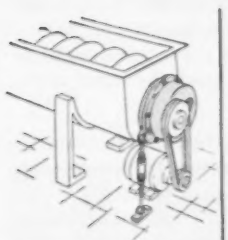
...Steel can "take it"!

STEEL frame ...of fabricated plate supports all rotating elements—provides double the ability of iron to maintain vital alignment of revolving elements, even under shock load or external impact.

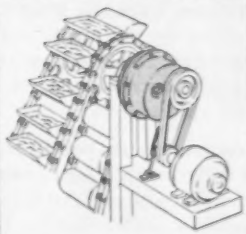
STEEL housing...will not fracture, serves only as protective cover and lubricant reservoir. Therefore, lubricant supply is safeguarded.

STEEL tie-rod and straddle-mounted tie rod brackets...are fastened to heavy steel frame by steel bolts in double shear.

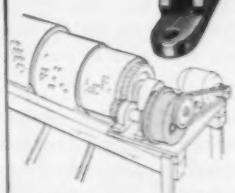
A FEW TYPICAL APPLICATIONS



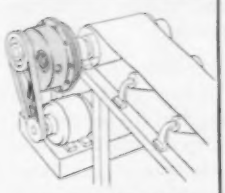
SCREW CONVEYOR



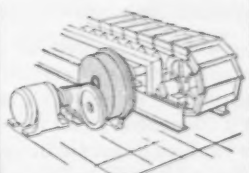
BUCKET ELEVATOR



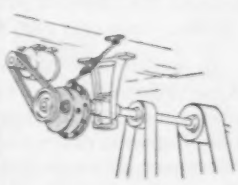
GRAVEL CLASSIFIER



BELT CONVEYOR



APRON FEEDER



LINE SHAFTING

DELIVERIES TO MEET YOUR REQUIREMENTS

Off-the-shelf delivery from your Authorized Falk Distributor. *Shipment from factory or warehouse stocks* within 72 hours after receipt of your order.

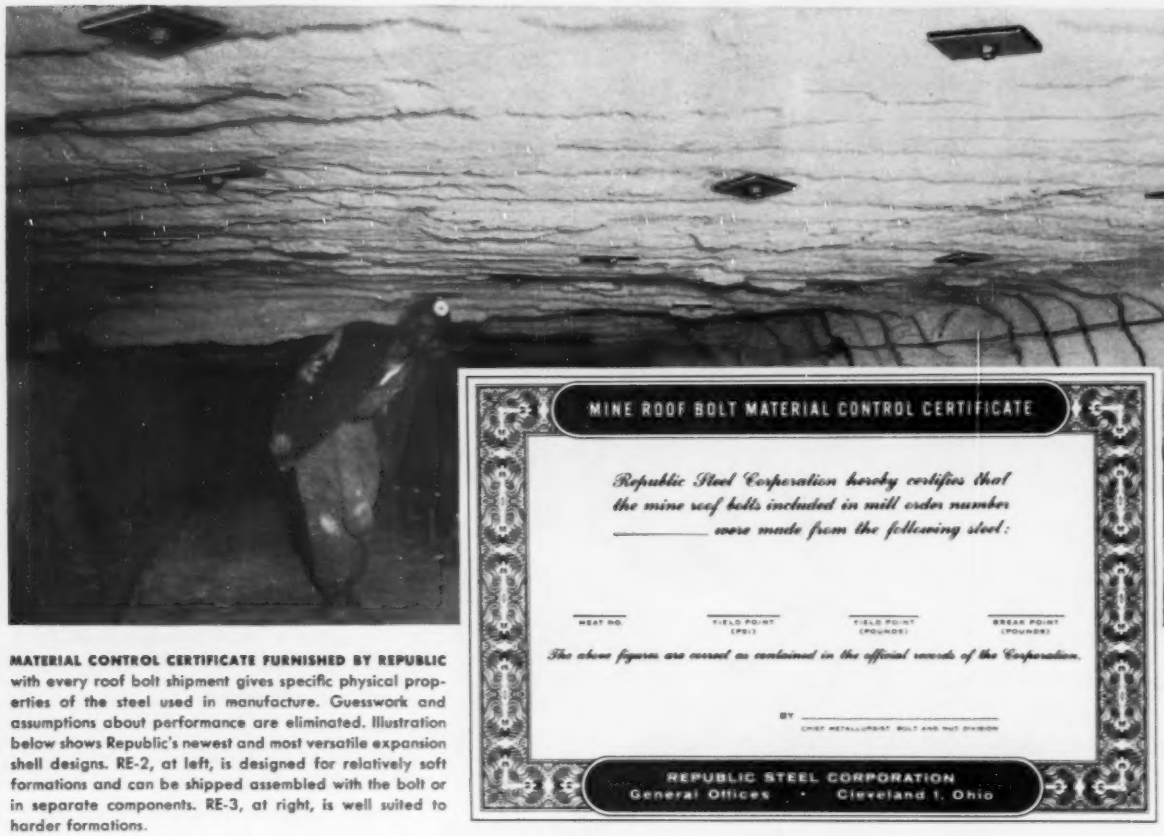
Write for Bulletin 7100

THE FALK CORPORATION, 3001 W. CANAL ST., MILWAUKEE 1, WIS.
Representatives and Distributors in Most Principal Cities
Manufacturers of Quality Gear Drives and Flexible Shaft Couplings

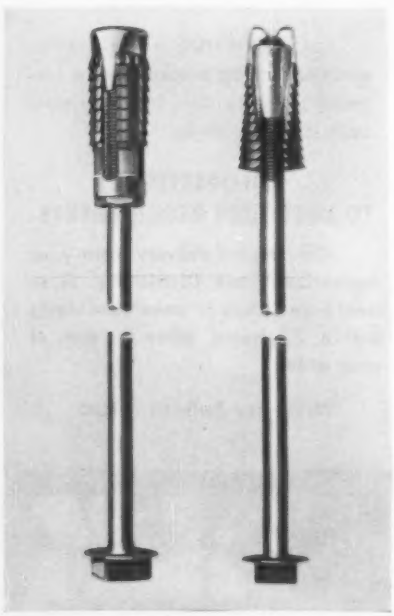
FALK
...a good name in industry

CERTIFIED STEEL ASSURES SUPERIOR STRENGTH

In Every Republic Roof Bolt Sold


MINE ROOF BOLT MATERIAL CONTROL CERTIFICATE
Republic Steel Corporation hereby certifies that the mine roof bolts included in mill order number _____ were made from the following steel:
HEAT NO.
YIELD POINT (PSI.)
YIELD POINT (POUNDS)
BREAK POINT (POUNDS)
The above figures are correct as contained in the official records of the Corporation.
BY _____
CHIEF METALLURGIST BOLT AND NUT DIVISION
REPUBLIC STEEL CORPORATION
General Offices · Cleveland 1, Ohio

MATERIAL CONTROL CERTIFICATE FURNISHED BY REPUBLIC with every roof bolt shipment gives specific physical properties of the steel used in manufacture. Guesswork and assumptions about performance are eliminated. Illustration below shows Republic's newest and most versatile expansion shell designs. RE-2, at left, is designed for relatively soft formations and can be shipped assembled with the bolt or in separate components. RE-3, at right, is well suited to harder formations.



No matter what roof-bolting problems you face, in high or low roof areas . . . hard or soft formations, Republic Roof Bolts offer a combination of advantages unmatched by any other manufacturer to assure maximum top-holding reliability. Not the least of these advantages is Republic's exclusive Material Control Program, plus the most complete selection of roof bolts on the market.

Because Republic is an integrated steel producer, the Material Control Program actually extends from mining and blending of raw ores to finished roof bolt production. Key element in this procedure is a series of physical tests which every heat of steel used in roof bolt manufacture must pass. Test results entered on Material Control Certificates, accompany all shipments as direct evidence that Republic Roof Bolts meet or exceed the physical properties standards approved by the American Mining Congress and American Standards Association.

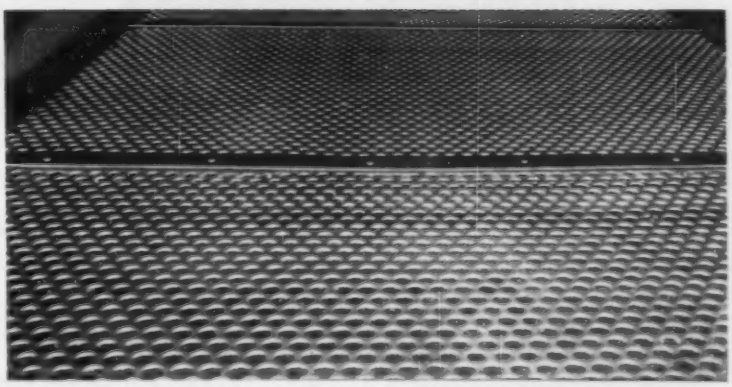
In addition to laboratory-certified steel, all Republic Roof Bolt Assemblies are backed by the findings of extensive field performance tests conducted in Republic's own mines. As a result of these studies, only Republic offers proved assemblies in all four major classifications. Moreover, this experience enables Republic impartially to recommend the type or types best suited to conditions in your mine, along with suggested methods of placement and spacing.

For complete information on certified-strength Republic Roof Bolts, contact your Republic representative or mail coupon.

MANY SUPERIOR FEATURES OF REPUBLIC'S NEW TRUSCON STEEL BUILDINGS contribute to their economical performance in mining applications. All parts are delivered in a complete package, including roofing, siding, windows, doors, and hardware, ready for fast, easy erection. Available in 32-, 36-, 40-, 44-, and 48-foot widths, 12- and 14-foot heights, and any required lengths, these Truscon "Budget Buildings" are ideal for personnel, equipment, or material shelter. Roofing and siding are galvanized to eliminate painting. Buildings can be dismantled and stored or re-erected to meet changing needs. Send coupon for details.

SUPERIOR STRENGTH PLUS CORROSION-RESISTANCE are two of the many features of Republic High Strength Steel which make it ideal for a wide variety of mine industry applications. In mine car and hopper car use, for example, these factors contribute to greatly reduced maintenance. Republic High Strength Steel also provides good impact and abrasion-resistance. It will pay you to evaluate all of these advantages in terms of your equipment performance specifications. For more information, mail coupon.

SUPERIOR PERFORMANCE OF REPUBLIC ENDURO® STAINLESS STEEL used for this cleaning plant shaker screen has drastically reduced replacement expense. Reason is ENDURO'S excellent resistance to abrasion and corrosion. Other characteristics of ENDURO which pay service dividends in mine equipment applications include its good strength-to-weight ratio, easy cleanability, and high impact strength. In addition, ENDURO is readily formed and welded, simplifying both manufacturing and maintenance operations. Mail coupon for data.



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World's Widest Range of Standard Steels and Steel Products

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1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on:

☐ Mine Roof Bolts ☐ Truscon Steel Buildings
☐ High Strength Steel ☐ ENDURO Stainless Steel

Name_____ Title_____

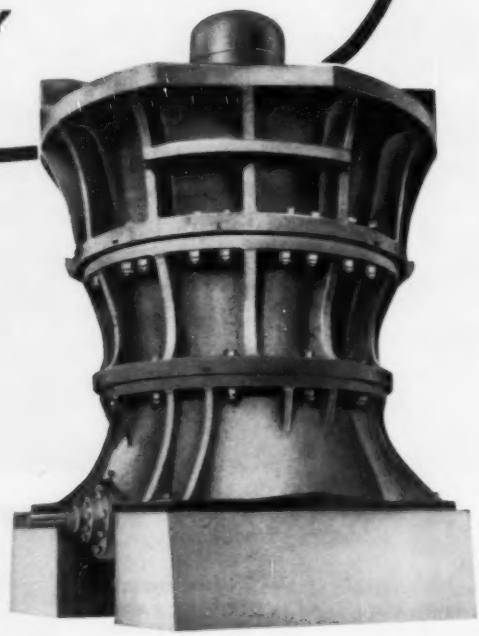
Company_____

Address_____

City_____ Zone____ State_____

Traylor-MADE
TC GYRATORY CRUSHER

26" Bulldog Gyratory Crusher in zinc and lead producing plant.



Over a half-century of engineering experience is built into Traylor Gyratory Crushers. Original self-tightening bell head and curved concaves—patented dust seal—positive outside automatic lubrication system are a few of the features of the Traylor TC Gyratory Crusher. Made in seven sizes with feed openings 20" to 60" and capacities from 1240 to over 32,000 tons per eight hour day. For specifications, ask for Traylor Bulletin No. 1126.

Traylor

TRAYLOR ENGINEERING & MFG. CO. 1051 MILL ST., ALLENTOWN, PA.

Sales Offices: New York — Chicago — San Francisco

Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P. Q.

ONE OVERHAUL IN 7 YEARS

Since they installed their first "Jimmy" Diesel

The GM Diesel-powered Marion shovel used by Kentucky's W. G. Duncan Coal Company has worked steadily two 8-hour shifts per day for seven years—with only one engine overhaul. The company also uses three GM Diesel-powered rear dumps in their stripping operation.

Superintendent J. T. Reynolds says: "Our GM Diesel-powered units have been most economical on fuel, maintenance and overhaul despite the tough job they have been doing. These units have helped provide a most efficient and profitable operation."

Two-cycle design makes a "Jimmy" faster accelerating—gets more work done per day. It's also smoother, so there's less wear and tear on equipment. And the positive crankcase pressure of Uniflow blower scavenging means there is no vacuum to suck in dirt—no need for special crankcase protection devices offered on other Diesels. Get full facts from your GM Diesel distributor—see why it's good business to specify GM Diesel in any equipment you buy or repower.

DETROIT DIESEL ENGINE DIVISION OF GENERAL MOTORS, DETROIT 28, MICH.

GM DETROIT DIESEL POWER

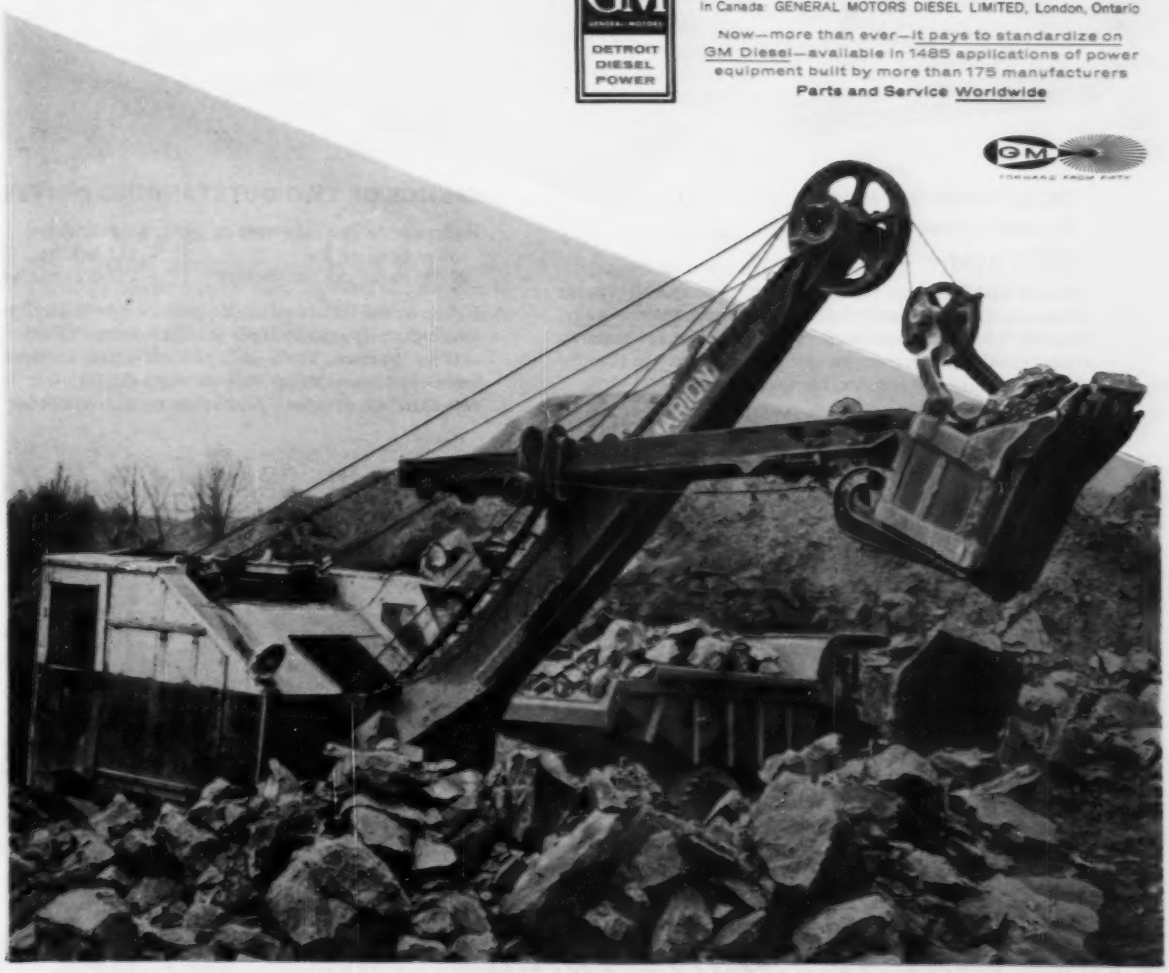
Regional Offices: New York, Atlanta, Detroit, Chicago Dallas, San Francisco

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

Now—more than ever—it pays to standardize on GM Diesel—available in 1485 applications of power equipment built by more than 175 manufacturers

Parts and Service Worldwide

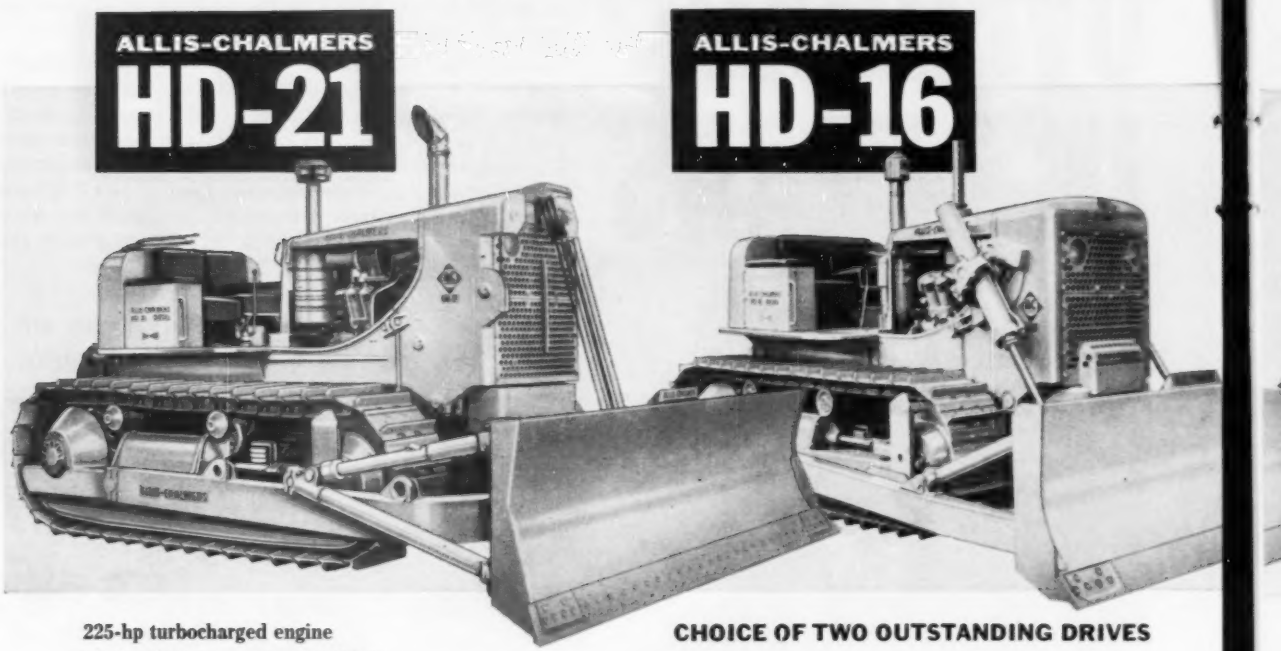
GM FORWARD FROM EIGHTY



Limestone overburden removed by W. G. Duncan Coal Company, Greenville, Ky., is hauled to a crushing plant. Duncan's Marion shovel and 3 Euclid 49TD's are each powered by a GM "6-71" Diesel.

ALLIS-CHALMERS CRAWLER TRACTORS . . .

first choice on more and



225-hp turbocharged engine
Hydraulic torque converter drive
56,260 lb (approx. as shown)

The new HD-21 brings you live power for today's big-tractor jobs—and torque converter drive puts it to work automatically. The HD-21 offers more work capacity—dollar for dollar—than any other big crawler tractor you can buy.
HD-21A illustrated—Two other models available

CHOICE OF TWO OUTSTANDING DRIVES

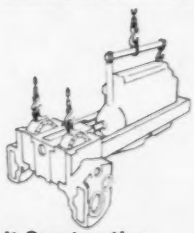
Hydraulic torque converter	All-gear drive
150 net engine hp	141 belt hp
39,090 lb (approx. as shown)	125 drawbar hp

Get up on the HD-16 yourself—and see how it handles jobs ordinarily assigned only to bigger, more expensive crawler tractors. You'll sell yourself—just as more keen-eyed construction men do every day.
HD-16DC illustrated—Five other models available

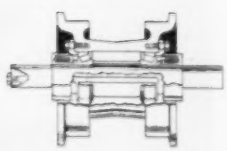
THE ONLY COMPLETE LINE OF CRAWLER TRACTORS

Pioneered and proved by Allis-Chalmers Engineering in Action

Torque Converter Drive gets more work done—automatically provides the right pull or push for every load, at maximum speed for existing conditions. *(Available in HD-21 and HD-16 only.)*



Unit Construction saves valuable time . . . lets you remove any major assembly without disturbing adjacent assemblies.



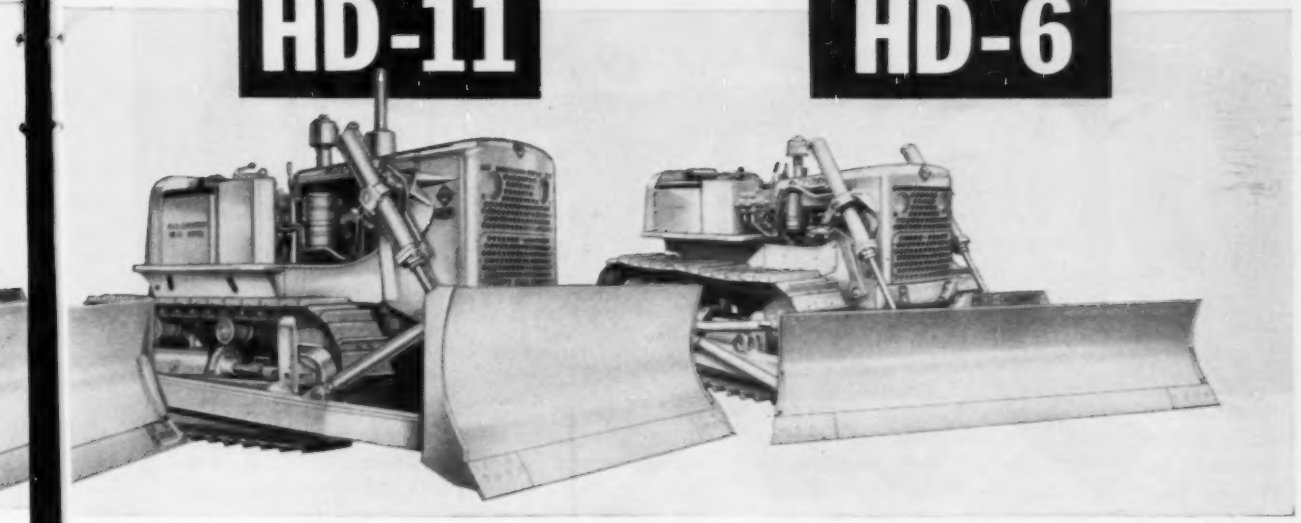
1,000-Hour Lubrication intervals for truck wheels, idlers, support rollers . . . changes daily greasing time into production time.

Look ahead...*move ahead*...and stay ahead

more tough jobs

ALLIS-CHALMERS HD-11

ALLIS-CHALMERS HD-6



94 belt hp

25,960 lb (approx. as shown)

The HD-11 is setting new standards in its size range . . . offers you dozens of work-boosting advantages, including the industry's easiest shift pattern. A single shift takes it from any forward speed to any reverse—gets short-cycle jobs done faster, easier.

HD-11B illustrated – Two other models available

63 belt hp

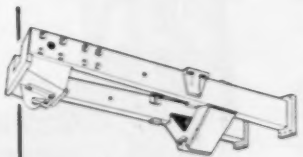
16,470 lb (approx. as shown)

Here's up to 15,500 lb drawbar pull. The HD-6 is the only tractor near its size with big-tractor design advantages—for example, All-Steel Box-A main frame and engine-mounted dozer with direct-lift cylinders for improved weight distribution, accurate dozing and long life.

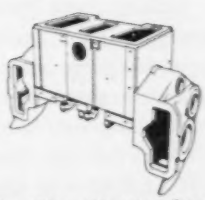
HD-6E illustrated – Three other models available

THAT GIVES YOU ALL THESE ADVANTAGES IN EVERY SIZE

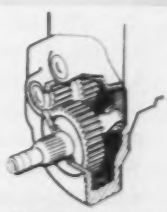
True-Dimension Track heat-treated and machined in the industry's most modern facilities, is setting new track-life records on every type of work.



All-Steel Box-A Main Frame soaks up shock and strain . . . provides improved weight distribution and equipment mounting.



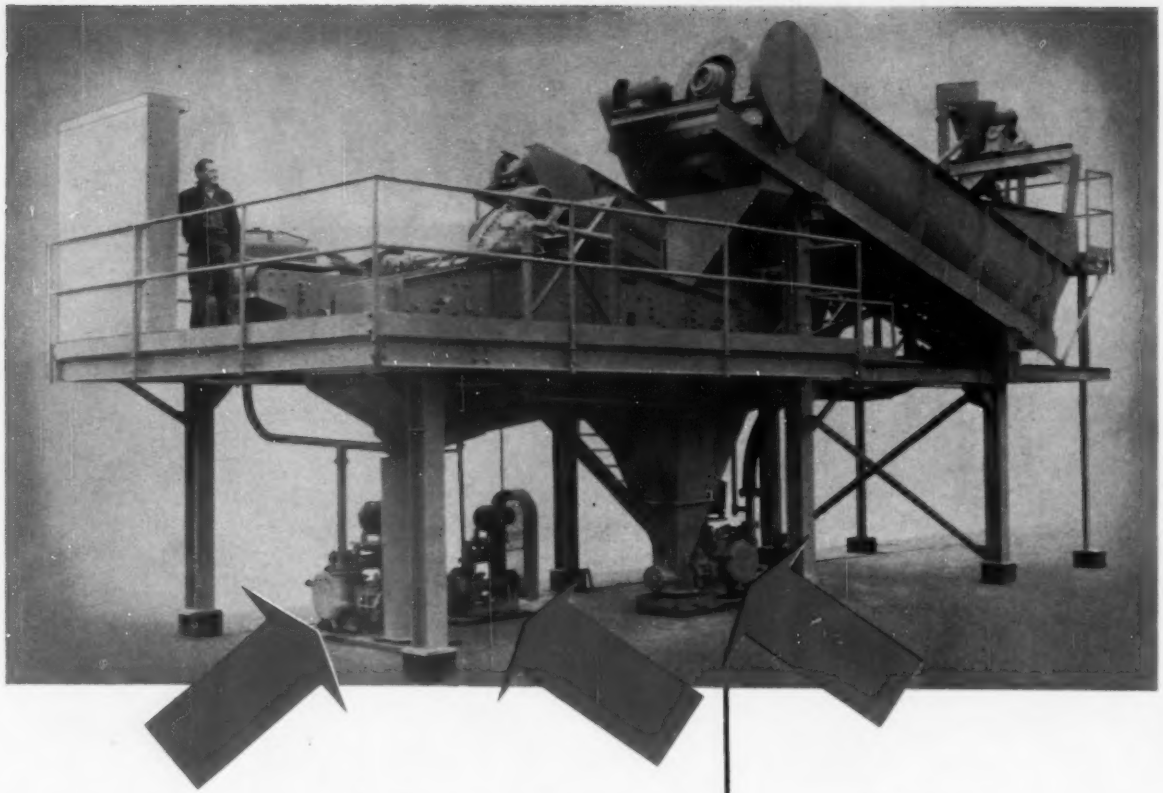
One-Piece Steering Clutch and Final Drive Housing with extreme rigidity and strength . . . line-bored to provide precise alignment of gears and shafts.



Straddle Mounting of All Final Drive Gears with tapered roller bearings on both sides of short, large-diameter shafts . . . provides extra gear life.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

with ALLIS-CHALMERS



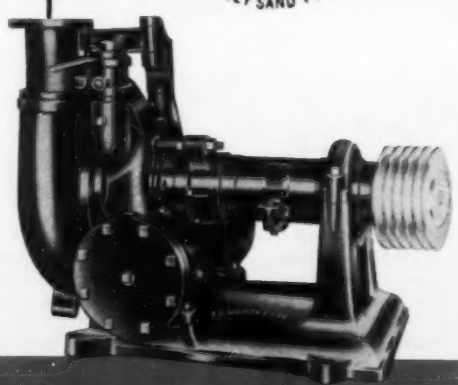
In this Heavy-Media-Separation Plant SWECO relies on WILFLEY SAND PUMPS for low-cost, trouble-free service.

Southwestern Engineering Company's factory-built Heavy-Media-Separation Plants permit the recovery of low grade waste ores... convert them into profitable products. Wilfley Sand Pumps are a vital factor in this operation. Their maintained high efficiency, long pump life, and continuous, maintenance-free performance guarantee lower pumping costs and increased production. Let Wilfley Sand Pumps go to work for you. Available with long-wearing parts of hard alloy or abrasion-resistant rubber.

Write, wire or phone for complete details.

INDIVIDUAL ENGINEERING ON EVERY APPLICATION

WILFLEY ACID PUMPS
"COMPANIONS IN ECONOMICAL OPERATION"
WILFLEY SAND PUMPS



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ENGINEERING AND MINING JOURNAL

JUNE 1958

A New Outlook for Copper

COPPER & BRASS RESEARCH ASSOCIATION's convention at Hot Springs, Va., in May explored aspects of the copper industry's problems which should interest copper producers everywhere. Since many of the topics concerned both producers and fabricators of copper, CABRA invited representatives of major metal companies to attend. This in itself is significant, because CABRA was originally formed by producers to dispose of surpluses of copper after World War I. Then through the years it became a research organization serving the interests of copper and brass mills making rods, tubes and other semi-manufactures. Now, however, it appears that the problem of marketing and merchandizing copper and brass is not solely that of the companies which work the metal, but also that of the parties who mine, mill, smelt and refine the copper—in fact, anyone who derives a profit from the sale of copper from miner to product salesman.

CABRA's convention this year was unique in another respect. Speakers representing industries which produce metals in competition with copper and brass, specifically stainless steel and aluminum, were invited to explain their philosophies and methods of marketing and merchandizing. After listening to comments on the programs of the aluminum and stainless steel manufacturers (producers as well as fabricators) to place metal in the hands of the ultimate consumer, the situation could be summed up this way—the copper industry can firm up its competitive position substantially by emulating the new product development programs of the aluminum and stainless steel producer. It was pointed out, for instance, that Aluminum Co. of America plans to spend about $17.6-million this year on research and development. This is about 2% of the gross. If the producers of primary copper in the U.S. had a comparable program, they would have a budget item of about $10-million for research and development (based on about 1-million tons of production at 25c per lb.). Another speaker at the convention suggested that copper producers should set the R&D target at about 0.6c per lb which is comparable to estimates of what aluminum producers are spending.

Also significant on the program was comment by P. A. Rinfret, director of the Economics Department of Lionel D. Edie & Co., that "business cycles are by no means dead" and that we will have more of them and probably more often. If this observation is correct, it would appear that the copper industry is going to have to develop a little more flexibility in coping with moderate shifts in demand. When a modest surplus of only 4% of production over consumption can send world prices plummeting from 55c to 20c in two years, it is quite obvious that world copper producers will have to make some changes in their concept of doing business. Consumers have given the industry a virtual ultimatum that if copper prices ever get out of hand again as they did in 1955, designers will "engineer copper *out*" of products on a wholesale basis.

The Communists have been quick to recognize the sensitivity of commodity markets to slight surpluses and shortages. What they are now doing to aluminum by dumping metal on the market, and have done to platinum, they could also do to copper. In its present shape, the industry is a sitting duck. The only remedy will be some gentlemanly restraint on the part of producers everywhere to adjust production to shifts in the business cycle, and reasonable efforts to prevent wide price fluctuations through more courageous pricing policies.

R. A. Quadt, vice president in charge of research and development, Bridgeport Brass Co., suggested that brass mills diversify their activities by processing other "sophisticated" metals such as molybdenum, columbium, titanium, tantalum, zirconium, etc., because the brass mills are accustomed to handling small quantities of metals involving special rolling or extrusion techniques. He noted that the industry is accustomed to supplying products to close tolerances with equipment that functions in the temperature range of 1,400 to 2,400 deg F. This suggestion is related to the newer concept of copper companies which have broadened their line to include other metals as well as copper. The new approach seems to be that no metal will have an automatic or traditional market. The metal that will do the job best will win out in the long run, and this means two things: diversification, and research and development to hold or broaden markets.

INSTITUTE MEDAL for distinguished service went to Robert A. Bryce (right). Presentation was made by Dr. H. J. Fraser.

SCROLL honoring his long-time services as Institute secretary was given to H. Mortimer Lamb. At left is Walter L. Gordon.

Miners Meet, Proclaim Western

R. CLAYTON JONES

CANADA'S UNSETTLED MINING picture was given a long searching look by leaders of the industry at the 60th annual general meeting of the Canadian Institute of Mining and Metallurgy in Vancouver, April 21, 22 and 23.

The Diamond Jubilee meeting, hosted by the British Columbia Section of CIMM was attended by 1,300 delegates who dealt with the technological aspects of mining, as well as general problems ranging from the future of coal to the threat of Russia in world mineral markets.

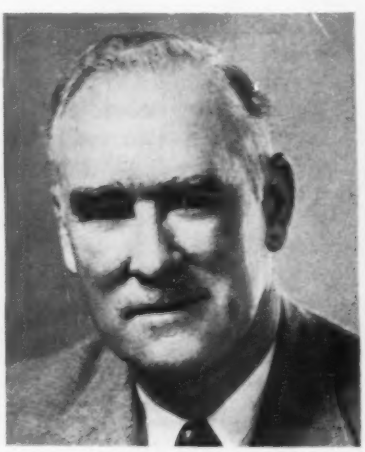
It was a real work-horse parley with as many as five technical sessions in progress simultaneously in three hotels, B. C. Electric Co. offices and Vancouver Library auditoriums. Guest speakers included such eminent industrial authorities as Walter L. Gordon, chairman of the Royal Commission on Canada's economic prospects; W. J. Bennett, president of Atomic Energy of Canada; J. C. Ingram, director of industrial development for Western Development and Power Ltd.; and Willard E. Ireland, B. C. provincial archivist and librarian.

Mr. Gordon called for a "full-dress" conference between Canada and U. S. to iron out mutual problems regarding minerals, downstream hydro rights, oil and natural gas.

Mr. Bennett, who relinquishes his presidential role this month, said nuclear power would ultimately place a ceiling on electrical energy costs, with production of nuclear power by

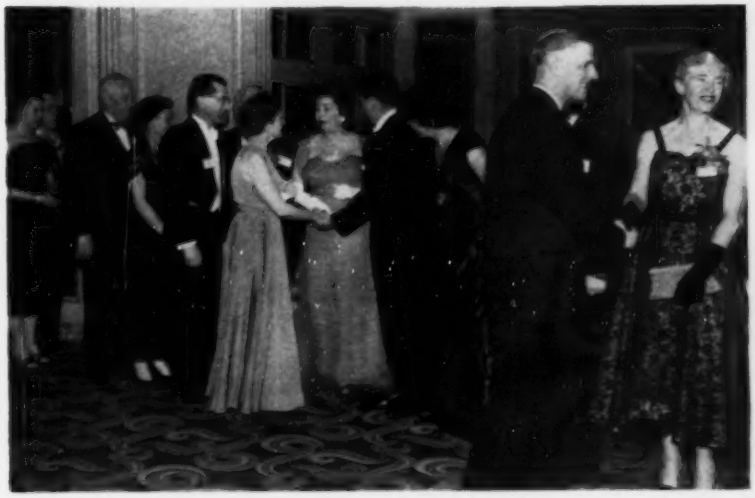
Mr. Jones is Vancouver correspondent for McGraw-Hill Publishing Co.'s Pacific Coast News Bureau.

BEST student essay won President's Gold Medal for Douglas C. Fraser.



INCO medal was won by William H. Durrell for Seven Islands-Knob Lake work.

PERSONAL geological endeavors won Blaylock Medal for Thayer Lindsley.



PRESIDENTS BALL guests were greeted by retiring president (next to white-gloved Mrs. Fraser) and incoming president (hidden next to Mrs. Burchell at far right).

Canada's Bright Future

late 1960's at a cost not in excess of six mills.

Mr. Ingram felt that reports of one mining discovery in Highland Valley of 150-million tons of 1% Cu, and another of 15-million tons of 2% Cu containing 30% Fe, might be forerunners of a smelter being built.

The temper of the convention that established a bleak immediate outlook for mining was obvious in the remarks of Dr. Fraser who stressed the industry's main need was for restored business confidence.

He said the slump in base metals was world-wide and "when you get that type of business condition you have to hope there will be a general change."

He could not predict when that change would come but "only in the long-term picture does the question of secondary fabrication make good sense."

He urged more money be spent on geological surveys in the Canadian North "because a lot of our future lies there."

In his presidential address Dr. Fraser said that by the end of 1957 virtually all phases of the mineral industry were suffering from overproduction or loss of markets and from reduced prices for their products.

"Despite the rapid development of this trend, particularly during the latter part of the year, the statistics for the year indicated new records in some important fields and an overall accomplishment that marks 1957 as the best year to date in our industry. The dollar value of our production exceeded somewhat that of 1956, was double that of 1950 and quadruple that of 1945.

"The tremendous expansion in the minerals industry during the post-war period has been in response to a strong demand from abroad for those of our mineral products needed to rebuild the devastation of war, to provide the added facilities and amenities demanded by people as a result of seeing what others had during and after the war, and from a temporary and artificial market created chiefly in the United States by stockpiling against the possible needs of a future emergency.

"The physical devastation of war in Western Europe has been mostly repaired and we have now reached a stage where most stockpile requirements have either been filled or will be filled from production facilities now extant. We obviously face a change in pace; for how long and to what extent, I leave to you to decide," Dr. Fraser said.

During informal interviews and press conferences between the sessions, the top echelon of Canada's mining executives confirmed this present unsettled picture and also that the outlook would probably become better in the long run.

The spokesmen said increases in U.S. duties on Canadian lead and zinc were "a matter of considerable disturbance to Canadian mining people." Little anticipation of stabilization of mineral prices could be seen until "the very significant current change under way in the U.S. stockpile picture" was completed.

Action by U.S. on the price of gold was anticipated.

"The gold picture is getting much more interesting now than it has been for many years," said Dr. R. A. Bryce, Toronto. "The gold mines of the world have been producing a billion dollars worth yearly. It has gone to the Orient and to the Arab nations who are hoarding it for oil. One of these days the U.S. will want to change the price of gold and change it mighty fast. If the reces-

THE LADIES had plenty to do. Mrs. F. J. Hemsworth (right), vice chairman of the ladies' committee, welcomes three delegates at get-together coffee party.

BARLOW AWARD for 1957 was shared by three—Drs. W. H. White (left), R. M. Thompson (center) and K. C. McTaggart—for their paper "The Geology and Mineral Deposits of Highland Valley, B. C." published in *CIMM Bulletin*, August 1957.

sion gets worse it will bring a change in gold prices."

He said the one thing Russia valued was gold and "sometime we'll even see a gold ruble!"

The majority of delegates were in favor of the Gordon proposal for a top-level U.S.-Canada conference on resources. The Diefenbaker government in Ottawa was reported to also be receptive to the idea.

"At the moment we have not had any concrete attempt made to meet these problems of interdependence," said V. C. Wansbrough, Toronto, vice-president, Canadian Metal Mining Association. "But it would be most surprising if we did not see steps along this line very soon."

He said the CMMA has sent a memorandum to Ottawa.

Russia looms as a potential threat in world metal markets, but because production figures are not known, the role of the Soviet is difficult to forecast.

"Russia has a Precambrian area several times larger than Canada's and probably the same mineralization," said John Drybrough of Ottawa. "Inevitably it will be a large source of metals, but it's a question of time for transportation and development.

Of uranium, the mining people are looking for a period of "uncertainty" from the end of military demand to advent of wide use in the civilian market.

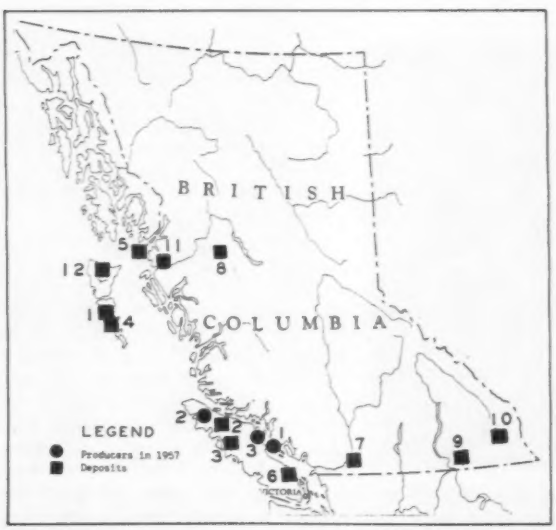
"It is generally thought that about 1965 we will have nuclear stations to produce power at six mills," said R. E. Barnett of Eldorado.

"The demand for uranium will rise steeply in the late '60's. We are optimistic about the future but there is an in-between period of which we're not sure."

Of labor, John Beattie, executive director, Ontario Mining Association, summed up delegates' feelings when he said labor costs formed "a very vital factor" for the industry.

"Labor costs range from 40 to 60% of operating costs, and these don't vary as in other industries. "All our unions are virtually controlled outside Canada and ours is an industry that is frozen in with one world price," Beattie said.

In a symposium on the Rocky Mountain Trench, where surveys by Wenner-Gren are currently under



British Columbia Iron Deposits Discussed by T. H. James

Iron ore producers in 1957

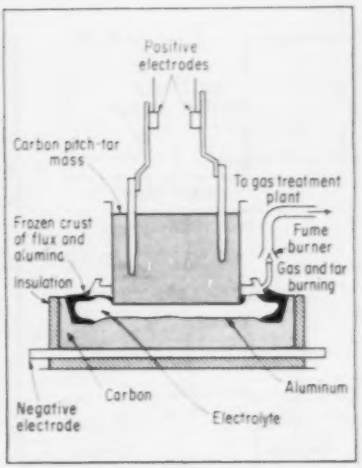
1. Texada Mines Ltd.
2. Empire Development Co., Ltd.
3. Argonaut Mine Div., Utah Co. of the Americas

Other iron occurrences

1. Tassoo (Wesfrob Mines Ltd.)
2. Kla-anch (Anyox Metals Ltd.)
3. F. L. or Zeballos (Anyox Metals Ltd.)
4. Ikeda (St. Eugene Mining Corp. Ltd.)
5. Porcher Island (Utah Co. of the Americas)
6. Lady of Taconite (Ladysmith Development Ltd.)
7. Lodestone pyroxenite (U. S. interests)
8. Zyometz River limestone deposits
9. Kitchener hematite
10. Kimberley pyrrhotite
11. Ecstall pyrite
12. Graham Island beach sands (Mogul Mining Corp.)

From T. H. James's "Iron Ore and Other Raw Material Sources for a Primary Iron and Steel Industry in Western Canada", CIMM, 1958, Vancouver.

NOVA SCOTIA coal miner, David G. Burchell is president-elect of CIMM.



EACH Kitimat aluminum pot produces 1500 lb of primary aluminum a day.

way, delegates were told that mineralization has been determined in the trench but that, due to the few outcrops, some 80% of the favorable area is unexplored. This report, given by E. Bronlund, Vancouver mining engineer, said that most of the metallic mineral deposits occur in the southwesterly belt.

Even if recoveries are low, the known potash reserves of Saskatchewan exceed those of any other potash field in the world. R. L. Cheesman briefly notes their size, mineralization and present status in his "History and Geology of Potash Deposits in Saskatchewan". Data was compiled by the author and members of the Saskatchewan Department of Mineral Resources, and the author made particular reference to the splendid work done by Miss Marion Goudie, geologist.

Canada's large reserves of titanium-bearing materials have received considerable attention in the past few years, according to R. A. Elliott in "Beneficiation of Titanium Ores With Particular Reference to Canadian Ores". Mr. Elliott is with Ontario Research Foundation, Toronto, and he discussed all the methods of concentration of the various rutile and ilmenite bearing deposits known, including the Sorel Slag Process as shown on p 87.

The Yukon Territory, one of the most accessible, relatively undeveloped regions of Canada, has major mineral possibilities. History, active producers (Galkeno, United Keno, Yukon Consolidated, Yukon Explorations and Waddco Placers), exploration and favorable regions shown on the map below, were detailed by Aaro E. Aho, consulting geological engineer, Vancouver, in his paper "Mineral Possibilities of the Yukon Territory".

Discussing iron ore resources, T. H. James stated that the pyrrhotite tailings pile of Consolidated Mining & Smelting Co. Ltd. at Trail, B. C., represents the largest known iron ore source in western Canada—over 28-million tons of 47% Fe and 33% S. Trail adds to the tonnage at a daily rate of from 1200 to 1600 tons; about 400 tpd is burned for sulphuric acid production.

Consolidated Mining & Smelting is studying the possibility of producing 100 tpd iron by an electric furnace process.

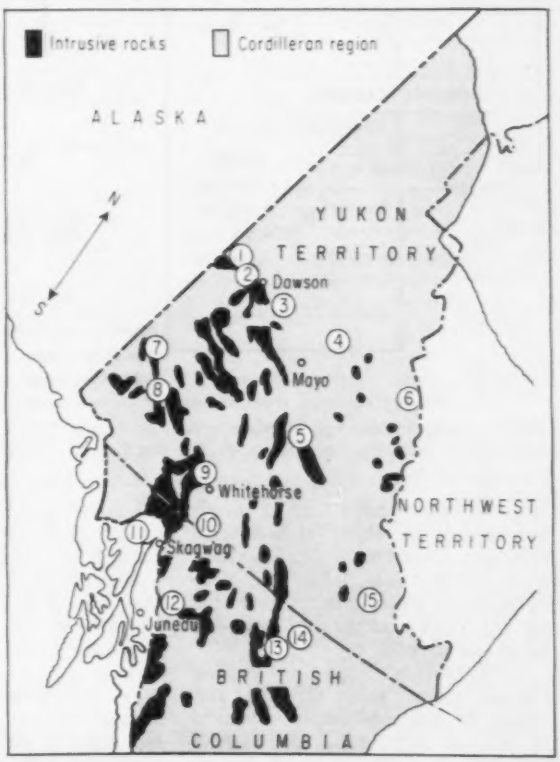
James discusses all the deposits shown on the map on p 84, including the several million ton holdings of Texas Gulf Sulphur (No. 11 on map). Deposit was first considered only as a source of sulphur, but is now considered as a source of copper, zinc, iron and sulphur. Deposit runs 35 to 40% Fe.

British Columbia and Alberta iron sources are covered, as well as other raw materials, market conditions and Provincial regulations.

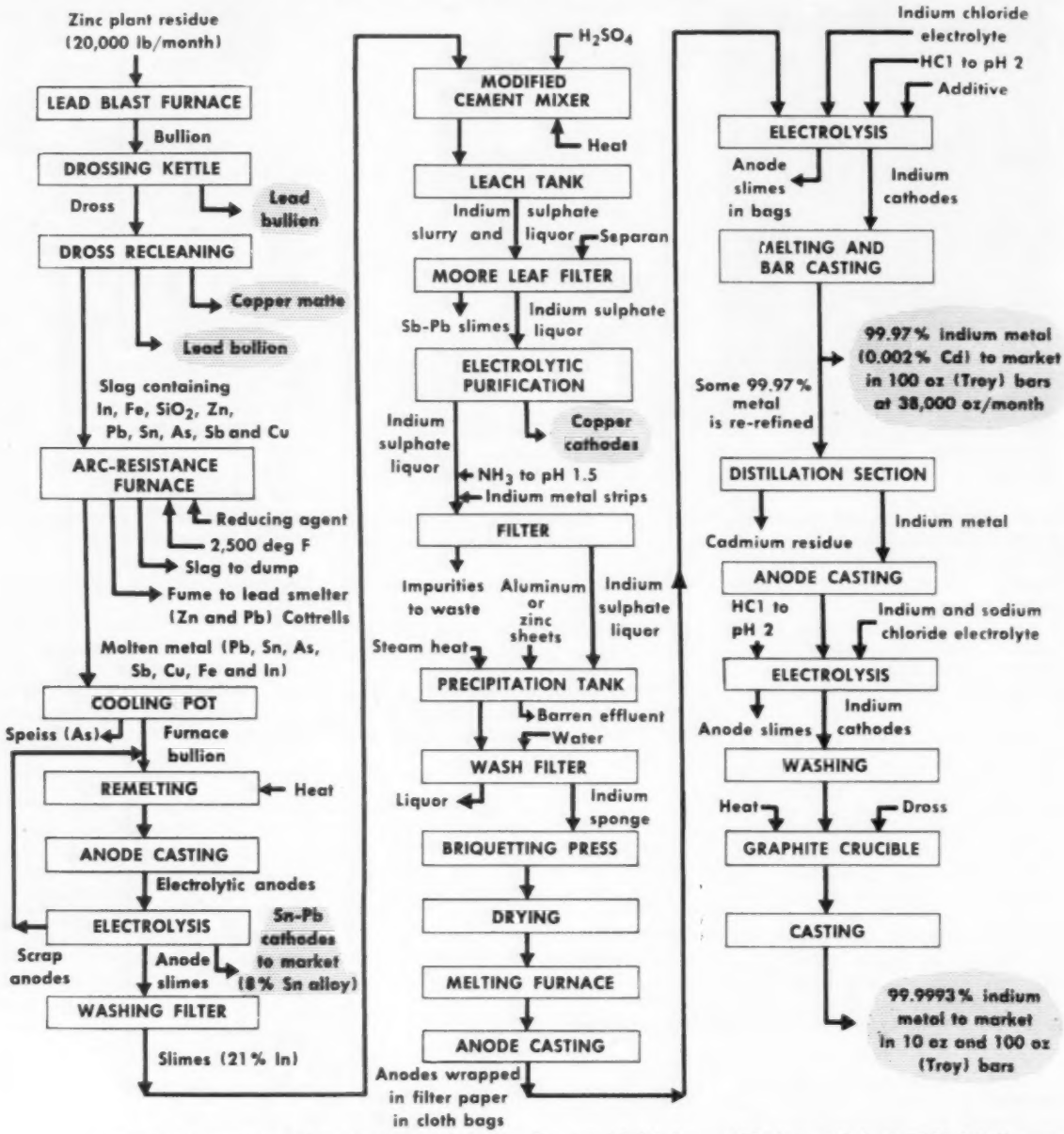
Prospecting must be done by saturating an area with men and equipment if the hidden resources of North America are to be uncovered, according to Christopher Riley, consulting geologist. Outcrops have nearly all been found, and most ore deposits are likely to be found in soft

LEGEND

1. Clinton Creek asbestos
2. Cassiar Creek asbestos
3. Klondike (Au)
4. Mayo (Ag-Pb-Zn)
5. Vangorda Creek (Pb-Zn)
6. MacMillan Pass (Pb-Zn)
7. White River (Cu-Ni)
8. Quill Creek (Cu-Ni)
9. Whitehorse (Cu)
10. Windy Arm (Au-Ag-Pb)
11. Klukwan titaniferous iron
12. Tulsequah (Cu-Pb-Zn-Ag-Au)
13. Cassiar Asbestos
14. Haskins Mt. (Zn)
15. Hyland River (Pb-Zn-Ag)



Redrawn, based on "Mineral Possibilities of the Yukon Territories", by Aaro E. Aho, CIMM, 1958, Vancouver.



Abstracted and drawn from "Consolidated Mining & Smelting Co. of Canada Ltd. Commercial Production of Indium", CIMM, 1958, Vancouver.

BOTH standard-grade and ultra high-purity indium metal are produced by Consolidated Mining & Smelting Co. of Canada Ltd. at Kimberley, B. C. As a result of the many processing steps described by author, metal assays 99.9993% pure indium.

fault or shear zones, under heavy overburden, or largely of weathered sulphides. Numerous deposits have been found under lakes and deep overburden. Exceptions to this rule are the hard quartz and magnetite veins and deposits.

In "Saturation Prospecting—A New Concept", Riley made particular reference to the exploration practiced by Hudson Bay Mining & Smelting Co. Each year, the Flin Flon crew moves into the bush in an ever widening circle around the town. Almost every prospecting tool is used. Every anomaly is drilled.

Riley suggests cooperative drilling with several mining companies footing the bill, and the use of oil company saturation drilling techniques. Oil crews drill through all favorable rock, going down several thousand feet. He pointed to the work at Mattagami and Bathurst as the nearest thing to saturation drilling in the mining industry.

A specially designed drill truck with a folding deck and three air legs made it possible for Geco to break 21 round cycles, advancing as much as 160 ft a week. P. C. McLeod described friction hoist installation, driving with the truck-mounted drills, ore transfer, crusher installation, and the operation of the underground concrete station on the 1250 level in "Underground Phase of the Geco Project—Some Methods Used to Meet a Production Rate".

Geco opened 47,000 ft of shaft, raise, drift and crosscut, and 600,000 cubic ft of service area in 29 months. During the same time, nine slusher stations, a crusher, conveyor system, loading station and other installations were made. Concrete plant was installed on 1250 because Geco plans to deepen the shaft in the future.

The problems involved in open pitting iron ore from several deposits at the same time in the Quebec-Labrador field were explained by V. Gregoire, Iron Ore Co. of Canada, in "Open Pit Practices, Knob Lake, Quebec".

The well-documented paper gives the problems and solutions of maintaining peak production in an area where only 200 working days are available each year. Selective mining produces direct shipping ore from several pits, with men and machines moving from pit to pit as needed.

Since large diameter rotary drills (9⅞ in.) do not lend themselves to the production drilling problems encountered, Knob Lake has moved in a small diameter rotary (4½ in. dia) mounted on a farm-type tractor. Tests are being conducted to determine whether or not this will be a better method.

Knob Lake started using ammonium nitrate-fuel oil blasting last summer and now does 75% of all breaking with this safe, cheap explosive. There are eleven 6- and 8-cubic yd shovels, sixty-six 34-ton trucks, 26 crawler tractors, and seven road graders on hand. Seventy-five percent of the equipment is in constant use; the rest available for spares during maintenance and breakdowns.

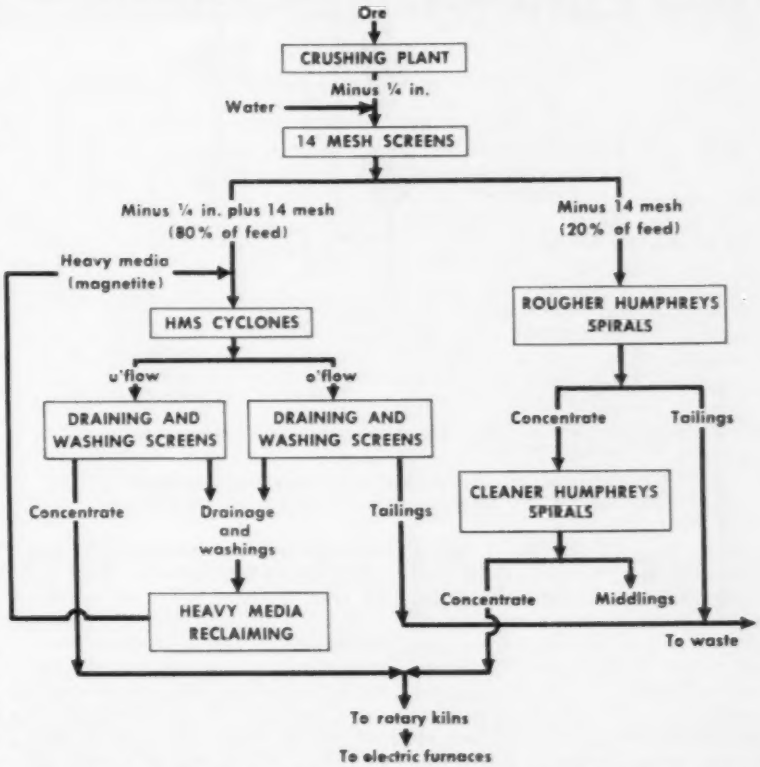
Training of new mining crews proved to be the most important factor in Algom Nordic's development program. In a staff paper entitled "Algom Nordic Development to Production", considerable emphasis is placed on the 12 training programs initiated at the mine and still in effect. New, inexperienced men are assigned to an instructor and undergo a team training period. Men are not assigned underground jobs unless they complete the program in a satisfactory manner.

Results have been excellent and these advantages were noted:

1. The quicker a man begins to make a bonus, the greater the chance that he will remain as a steady employee.

2. Not enough skilled workers are available.

3. Supervisors are relieved of the training job underground, and can stick to production problems.



Redrawn from R. A. Elliott's "Beneficiation of Titanium Ores With Particular Reference to Canadian Ores", CIMM, 1958, Vancouver.

SOREL SLAG PROCESS yields pig iron and high-grade titanium-bearing feed which is sold for further refining to paint-making grade titanium oxide by the purchaser.

4. Instructors form the nucleus of new supervisory employees. While teaching, they work in the mine to become familiar with all phases of mining.

5. Training will continue in the future. About one-third of the crew have taken the courses, and Nordic hopes to get all the rest through the program in the future.

One additional important point in the Nordic paper—Jumbo stoping has been replaced by air leg stoping with a resultant increase in man shift production from 15 to 20 tons.

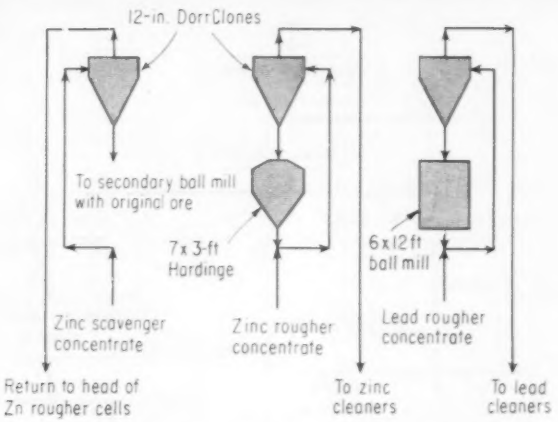
Regrinding the rougher zinc concentrate, the rougher lead concentrate, and the zinc scavenger product, produces a better finished lead concentrate and zinc concentrate at the Salmo, B. C., concentrator. In addition, tailing losses have been reduced considerably, according to H. A. Steane, general mill superintendent in "Regrind Practices at Canadian Exploration Ltd.".

Flowsheet on p 88 is the final result of several progressive changes. Ore containing galena, sphalerite and pyrite in a calcite-dolomite gangue is treated at the rate of 2,000 tpd. Grinding through 325 mesh is necessary to liberate the sulphides, yet with the regrind shown here, Canadian Exploration cut the mesh size of the tailings from 55 to 45% minus 200 mesh.

Prior to the change, lead concentrate assayed 70% Pb, zinc concentrate assayed 50% Zn, and tailings ran 0.3% Pb and 0.6% Zn. Here are the results with the present circuit:

	Pb%	Zn%
Lead concentrate	77	4
Zinc concentrates	1.3	58.5
Tailings	0.15	0.29

Kitimat's aluminum cells require 6/10 of a lb of carbon to produce a pound of aluminum—over 300 tons of finished anode paste are produced and used every day. Aluminum pots are 30 ft long and weigh about 100 tons each. They are designed for 100,000 ampere service with 20 tons of molten material. Operating temperature is 1,000 deg C on a current efficiency of 85% with the current providing melting heat, electron transfer and ion exchange, and baking the Soderberg electrodes. Kitimat cells are diagrammed on p 85.


12-in. DorrClones
To secondary ball mill with original ore
7 x 3-ft Hardinge
6 x 12 ft ball mill
Zinc scavenger concentrate
Zinc rougher concentrate
Lead rougher concentrate
Return to head of Zn rougher cells
To zinc cleaners
To lead cleaners

Redrawn from H. A. Steane's "Regrind Practice at Canadian Exploration Ltd.", CIMM, 1958, Vancouver.

REGRINDING rougher and scavenger concentrates cut Canadian Exploration's tailings losses and raised concentrate grades.

In his paper "Extraction of Aluminum at Kitimat", Bruce L. Davis illustrated the raw material needs of the project. Kitimat has a capacity of 180,000 annual tons of primary aluminum and design for eventual expansion to 500,000 tons. Kemano power installation has 1-million horsepower capacity and will have 2.4-million hp at full design. When at full design capacity, Kitimat will need over 1-million tons of alumina a year. They plan to install a recovery plant for the cryolite found in the cathode bottoms.

Several direct reduction processes for iron ore not mentioned in *E&MJ's* December 1957 review are available in W. M. Armstrong's paper "Recent Developments in Iron Smelting and Steelmaking Processes". Armstrong discusses and presents bibliographies on these additional processes—Electrochemist (Norway), Strategic Materials, Dwight Lloyd-McWane (McDowell Co.), several low shaft Belgian and German processes, and the Demag-Humboldt Process.

In addition, he mentions Lubatti, Ontario Research Foundation's Flame Reduction Process (similar to Cyclosteel) and Direct Ore to Steel Process. The latter ORF development is unique—producing a very pure iron concentrate which is reduced in a thin layer and rolled directly into strip steel while still in the reducing atmosphere.

Look at the over-all cost when choosing construction materials, suggests J. P. Ogilvie. It is often cheaper to use high first cost materials that have long service life, he notes. In "Use of Stainless Steels in Corrosion Control", Ogilvie discusses chromium's function in corrosion control, the major types of corrosion and their relief, and where stainless steels can be used. Stainless steels are not too well suited for sulphuric acid systems unless considerable agitation or strong oxidizing agents are present. Stainless steels are stainless only because of the rapid oxidation of the chromium on the surface. Corrosion is more rapid in quiet, oxygen-starved areas of equipment than at the surface. Ogilvie suggests stainless 20 Type alloys for sulphuric acid circuits.

How Consolidated Mining & Smelting Co. Ltd. recovers and refines indium was detailed by B. G. Hunt, C. E. T. White and R. A. King, research engineers, Research Div. For abstract of this paper see flowsheet on p 86.

Major awards were presented at the annual dinner. The John T. Ryan Dominion safety award for metalliferous mines went jointly to the Munro Mine of Canadian Johns-Manville Co. Ltd., Matheson, Ont., and the Bluebell Mine of Consolidated Mining & Smelting Co. of Canada Ltd., Riondel, B. C.

The trophy for coal mines was won by the McGillivray Mine, Coleman Collieries Ltd., Coleman, Alberta.

Regional safety trophies for metalliferous mines: (1) Quebec and East—to the Thetford Mines Operation, Johnson's Co. Ltd., Thetford Mines, Quebec; (2) Ontario—to the Munro Mine, Canadian Johns-Manville Co. Ltd., Matheson, Ontario; (3) Prairie Provinces and Northwest Territories—to the Beaverlodge Operation, Eldorado Mining & Refining Ltd., Eldorado, Sask.; (4) British Columbia and Yukon Territory—to the Bluebell Mine, Consolidated Mining & Smelting Co. of Canada Ltd., Riondel, B. C.

British Columbia Section of C.I.M.M. was host, and Henry M. Howard, chairman; Fred J. Hemsworth, vice chairman and Alex M. Sutherland, secretary, arranged a wide variety of social and general activities for delegates and their wives.

Mrs. H. M. Howard was chairman of the ladies' committee.

David J. Burchell of Bras d'Or, Nova Scotia, was installed as new president. Mr. Burchell, vice president and general manager of Bras d'Or Coal Co., succeeded Dr. Horace J. Fraser of Toronto, president and general manager of Falconbridge Nickel Mines Ltd.

In his official address, Dr. Fraser called on the mining and other industries to encourage higher education which "may determine our ability to survive as one of the leading nations of the world."

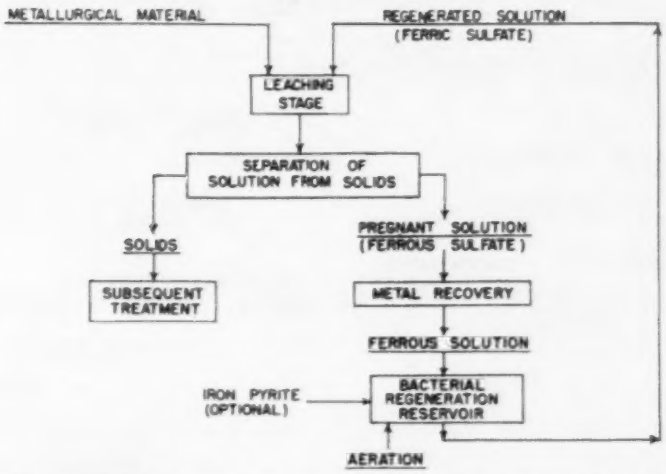
He also urged both companies and unions to help provide employment for graduates and undergraduates.

New vice presidents are: Fred Gover of St. John's, Newfoundland, (District 1—Maritimes and Newfoundland); Karl V. Lindell of Asbestos, Que. (District 2—Quebec and Labrador); Kenneth C. Gray, Kirkland Lake, (District 3—Ontario, East); G. Neely Moore, Port Arthur, Ont., (District 4—Man., Sask., and Ontario, West); R. A. Hemstock, Calgary, (District 5— Alberta and Northwest Territories); Jas. A. Pike, Vancouver, (District 6—British Columbia and Yukon).

Councillors are: Dist. 1—E. R. Edwards, Galt.; L. H. Fulton, Montreal; F. J. Lukins, St. John's,. Nfld.; A. M. Tooke, Minto, N. B.; R. M. Watson, Montreal: Dist. 2—W. W. Beaton, Noranda; B. T. Denis, Quebec City; W. J. Johnson, Thetford Mines; K. R. North, Malartic; F. E. Weldon, Montreal: Dist. 3—R. D. Baker, Matheson, Ont.; J. D. Bateman, Toronto; J. Convey, Ottawa; Wm. J. Daly, Spragge, Ont.; R. H. Waddington, Copper Cliff: Dist. 4—J. T. Cawley, Regina; W. G. Cowie, Winnipeg; J. W. Harding, Eldorado; B. Schneider, Flin Flon; L. H. VanLoon, Madsen: Dist. 5—D. J. McEachern, Edmonton; J. C. McGlynn, Yellowknife; A. S. McLatchie, Calgary; J. G. McNiven, Port Radium; K. N. Stewart, Fernie; Dist. 6—B. E. Hurdle, Trail; K. C. Fahrni, Allenby; J. W. Peck, Victoria; W. H. White, Vancouver; L. F. Wright, Vancouver.

Secretary-treasurer is C. Gerow; and assistant secretary is E. G. Tapp.

How Bacteria Leaches Low-Grade Ores



USING BACTERIA to leach and recover a metal from any metallurgical raw material with a ferric sulphate sulphuric acid lixiviant has been patented by Kennecott.

KENNECOTT COPPER CORP. just recently obtained a U.S. patent on bacteria leaching of ores containing sulphides and/or iron sulphate. According to Stuart Zimmerley, director of research and one of the inventors, Kennecott found that several strains of iron-oxidizing autotropic bacteria occur naturally in mine waters at Bingham Canyon and Chino.

These bacteria are able to live and multiply in relatively high concentrations of dissolved copper, and can be used to leach and recover copper, molybdenum and zinc from their sulphide or mixed oxide-sulphide ores. In addition, processes have been developed that use bacteria to upgrade iron-chromite and iron-titanium materials by leaching out the iron.

How the Process Came About

Kennecott's processes involves the use and continual regeneration of a ferric sulphate sulphuric acid lixiviant which has been inoculated with iron-oxidizing autotropic bacteria tolerant to relatively high concentrations of the particular metal or metals being sought.

For many years, waste water flowing from certain copper mines has been deliberately percolated and re-percolated through waste ore dumps and even back through the worked out areas of the mine to leach out whatever copper values might be contained. Copper has been recovered by scrap iron precipitation. In some cases very low grade ore deposits have been leached in place in this manner, but, generally speaking, this procedure has been regarded as far too slow to be economic if any other method is applicable at the same time.

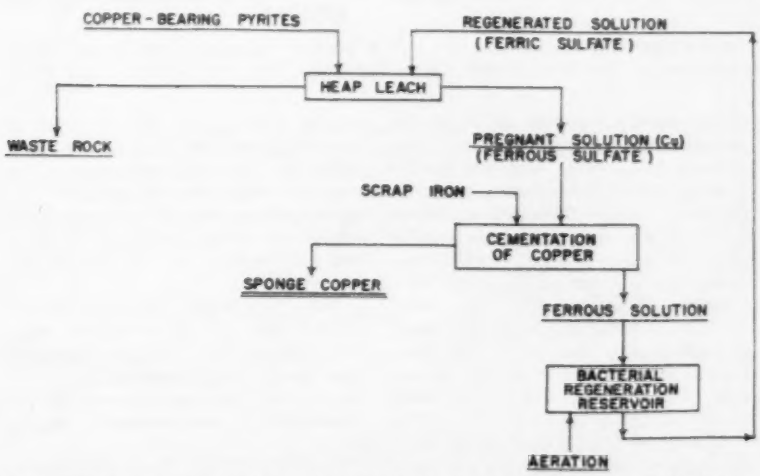
Ferric sulphate and sulphuric acid naturally present in the mine water is responsible for the solution of the copper. Ferric sulphate is also an effective lixiviant for a number of other metals. For example, metallic copper and iron are readily attacked by a ferric sulphate solution. Recovery of metal values from certain secondary or scrap materials, and upgrading of metallurgical products after a reducing roast are possible through ferric sulphate leaching.

Iron-bearing chromite and titanium materials can be roast-reduced and the metallic iron removed by ferric sulphate leaching. While lead sulphate is not readily soluble in brine solution alone, it is if ferric sulphate is present in the brine. Ferric ion in solution has proven to be valuable in the purification of electrolytic zinc and manganese solutions—the ferric ion serving as a carrier, removing the impurities from the solution.

In all these uses, the ferric ion is changed to ferrous by reason of the metallurgical reactions taking place during the leaching procedure.

Principal deterrent to any widespread use of ferric sulphate-sulphuric acid leaching, has been the need to regenerate the spent lixiviant before recycling it to fresh feed. In acid solutions, regeneration poses a considerable problem. Atmospheric oxidation of acid ferrous solutions to the ferric state is slow and not aided materially by aeration. While regeneration has been accomplished by the use of SO_2 and aeration, use of ferric sulphate-sulphuric acid leaching has been greatly hampered and limited by the need to generate the SO_2.

In recent years research work carried out on acid minewaters from coal mines in eastern U.S. has proven the existence of iron-oxidizing autotrophic bacteria which oxidize ferrous ion to ferric much faster than can be done by atmospheric aeration. This strain of bacteria has been tentatively named *Thiobacillus ferroxidans*.



LEACHING of copper-bearing pyrites with the ferric sulphate-sulphuric acid lixiviant inoculated with bacteria readily permits recovery of cement copper states patent.

Developing Bacteria Strains

More recently, research by Kennecott Copper on acid mine waters at Bingham Canyon and Chino has proven the existence of similar strains of iron-oxidizing autotrophic bacteria. And a definite indication of the ability of these bacteria to put many

metal sulphides into solution, in addition to making the ferrous-ferric conversion, was discovered.

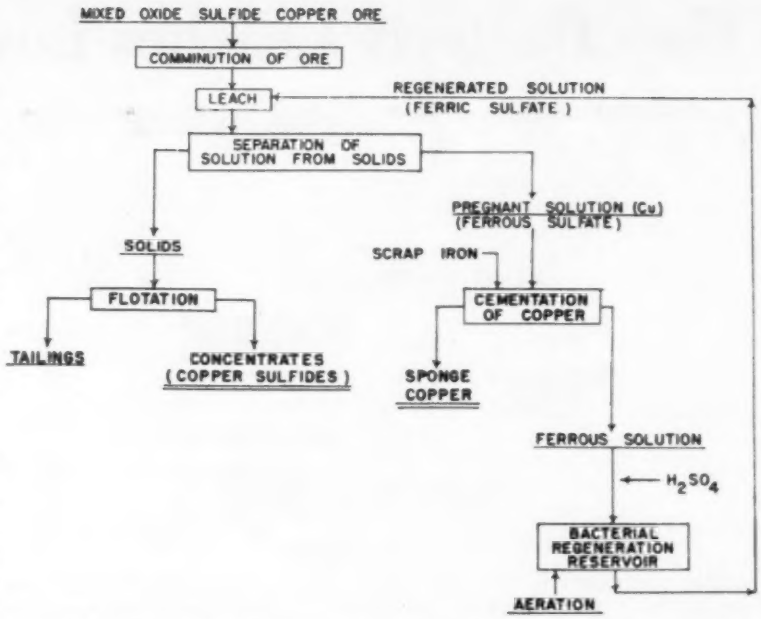
Kennecott found that these strains naturally occurring in the mine water can withstand and grow in relatively high concentrations of dissolved copper ion while having low tolerances for certain other metal ions. For example, Bingham Canyon bacteria will not grow in solutions containing more than 150 ppm zinc even though they will survive and thrive in solutions containing a higher concentration of copper.

By breeding successive generations of these bacteria in culture media more concentrated in other dissolved metals, Kennecott produced new strains of bacteria which will tolerate solutions containing relatively large concentrations of such other metals. For example, bacteria have been developed which have a zinc tolerance as high as 17 grams/liter (17,000 ppm as compared to only 150 ppm in the parent strain). Also, the tolerance to copper has been increased to about 12,000 ppm. Kennecott feels that these tolerances can be increased even more.

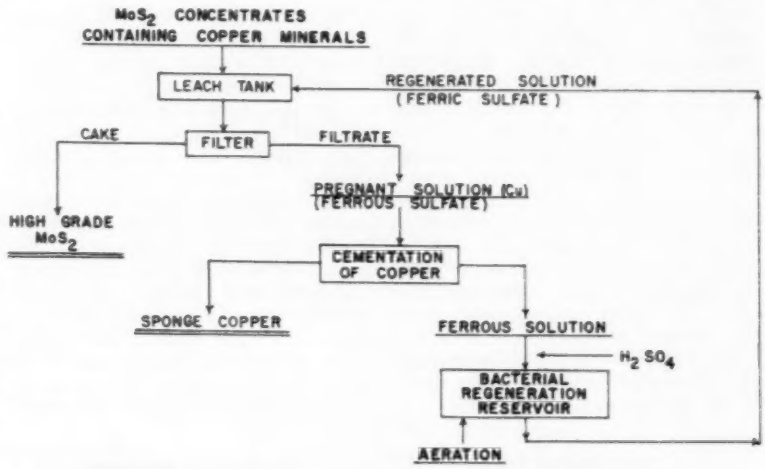
Particular strains of bacteria have been developed to these metal tolerances:

Aluminum	6,290 ppm
Calcium	4,975
Magnesium	2,400
Manganese	3,280
Molybdenum	160

Work has shown that the bacteria can act directly on pyrite to produce ferric sulphate and sulphuric acid. But, even more important, states the patent, is the exceptionally rapid manner in which the bacteria-carrying spent solution can be regenerated industrially by mere aeration without troublesome and expensive apparatus and procedures.



MIXED oxide-sulphide copper can be leached for its copper content by one of the processes covered in the patent. Both leaching and flotation are used in this case.



MOLYBDENITE concentrates can also be purified with the iron-oxidizing bacteria developed by Kennecott Copper Corp. High-grade MoS_2 and cement copper result.

What Processes Have Been Developed

Kennecott's basic process is a cyclic one using ferric sulphate-sulphuric acid carrying cultures of suitably tolerant bacteria in a sulphide mineral leaching stage which then passes through a regeneration stage within which the bacteria-carrying solution is subject to aeration and recycled to the process.

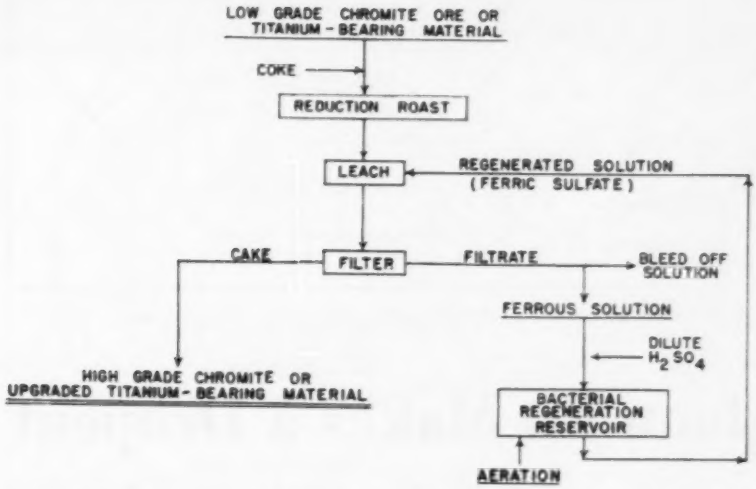
Repeated heap or vat leaching, or continuous vat leaching in series can be used. Or any other leaching technique may be employed which does not introduce killing amounts of other metal ions into the lixiviant. By aeration, the patent means the introduction of the air and carbon dioxide needed by the bacteria.

Kennecott's bacteria is a motile, non-sporing rod type approximately 0.5 to 1.0 μ wide and 1.0 to 2.0 μ long. They are autotropic, deriving their energy from the oxidation of ferric ion, and using carbon dioxide as a carbon source. Organic materials are not needed for their subsistence. They require an acid medium. Kennecott's strain has been deposited with the American Type Culture Collection, 2112 M Street, NW, Washington 7, D.C. It has been given Collection Catalog No. 12912.

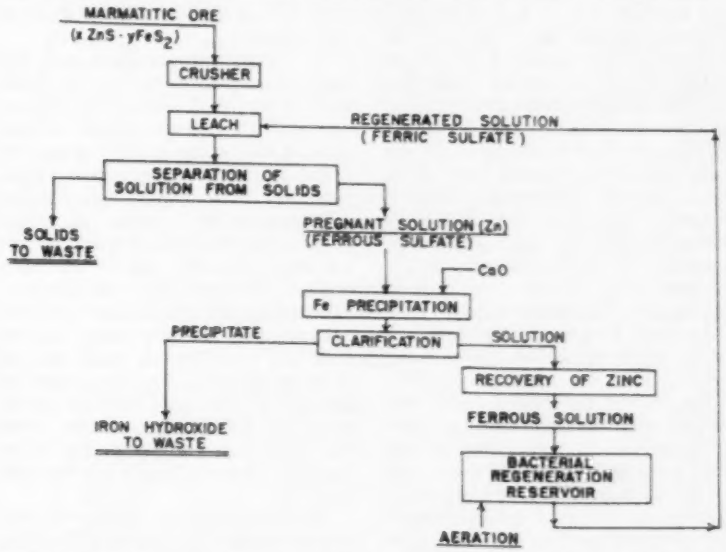
Kennecott is sure that similar bacteria can be found in almost any acid mine water. Kennecott has tried leaching with cultured batches added to the leach liquor, but says that it is more advantageous to use naturally occurring bacteria, and increase the metal ion tolerance by gradually increasing the amount of ion in the mine water; but being careful not to wipe out the bacteria in the inoculation process.

Tests have shown that naturally occurring bacteria can thrive in a pregnant solution of copper ion normally used in tin can cementation (11.74 gm/1). Reaction equation for the regeneration of the lixiviant is stated as:

$$2FeSO_4 + H_2SO_4 + \tfrac{1}{2}\,O_2 \xrightarrow{\text{bacteria}} Fe_2(SO_4)_3 + H_2O$$



LOW-GRADE chromite and titanium materials can be upgraded by using the ferric sulphate sulphuric acid lixiviant and bacteria to leach out the iron impurities.



ZINC, specifically marmatitic ores, can be leached to produce a zinc-bearing solution, a waste solids and a waste iron hydroxide with the aid of bacteria and reagents.

And in cases where the acid is all used up by the leaching process without a corresponding decrease in iron content, the ferric sulphate produced above may hydrolyze, precipitating the ferric salt and liberating more acid.

Such hydrolysis can be valuable if there is enough iron present. Where insufficient iron is available, sulphuric acid may have to be added to protect the ion make-up of the solution.

Iron may be added in the form of pyrite. Iron may be bled off the solution circuit where necessary. Kennecott warns that the equipment must be made of raw materials that will not kill the bacteria in themselves—such as red wood launders, tanks, etc.

Temperature must be controlled so as not to kill or immobilize the bacteria. Kennecott suggests a practical operating temperature maximum of 40 deg C.

Optimum pH in the Kennecott research appears to be 2, but excellent results have been obtained with pH range of 1.5 to 2.5. Bacterial activity decreases progressively and significantly below 1.5 pH.

Laboratory work has shown the possibility of enhancing bacterial action by adding certain nutrients to the lixiviant. Nitrogen in the form of nitrate or ammonium ion increases initial rate of activity, but apparently not affecting the later stages of the reaction. Bacterial activity increased significantly with increased nitrogen additions from 0 to 200 ppm, but economic optimum appears to be 100 ppm. However, after six months of operation, unfed and nitrogen fed bacteria showed the same degree of activation on new sulphide ore.—Source U.S. Patent No. 2,829,964, dated April 8, 1958. Inventors Stuart R. Zimmerley, Dean G. Wilson and John D. Prater, assigned to Kennecott Copper Corp.

LETTERS

In your February uranium review, second column on p 124, you state that Rhodesian production of uranium in 1957 was 300 tons . . . According to my information, the production of U_3O_8 in Northern Rhodesia in 1957 was 52,457 lb.

J. F. McLaren
Mines Department
Kitwe, Northern Rhodesia

Regarding your news story on the Bretz mercury mine in March 1958, pp 144 and 148, I wish to point out that the statement, "Some 7,751 flasks of mercury, according to Howard C. Brooks, were produced between 1931-1956," is incorrect. I assume from several other statements in the article that it was taken from the October 1957 issue of our departmental publication *Ore-Bin*. In the first paragraph of *Ore-Bin's* it states, "In the years 1931 to 1944 the property . . . produced 10,309 flasks . . ." I suspect that your writer misread the last paragraph on p 85 of this *Ore-Bin* article which reads "7,751 flasks in 1931-1936".

Howard C. Brooks
Geologist, State Dept. of Geology
Baker, Oregon

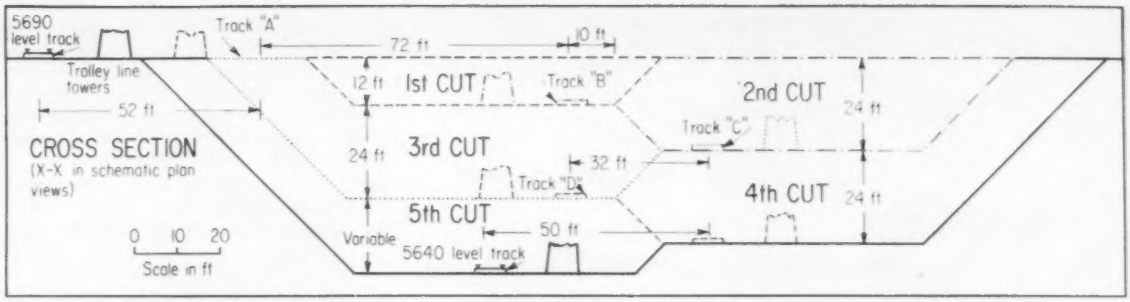
• Mr. Brooks is correct. The dates should have been 1931-1936.

As might be expected in an article covering so many aspects *(E&MJ,* April 1958, "Electrons and Ions"), there are one or two debatable points. For example, you give the Parkes Process as a true case of solvent extraction. It has been shown quite definitely that this is not the commercial basis of separation, but rather that it depends upon the solidification of a solid silver-zinc rich alloy from the molten Pb-Ag-Zn. I refer you to a very complete article by T. R. A. Davey in *Journal of Metals,* June 1954. On the same page, you refer to a charcoal cupel. As you probably know, the cupel is made of refractory . . . or bone ash.

A. W. Schlechten, Chairman,
Dept. of Metallurgical Engr.,
School of Mines, Rolla, Mo.

• Reprints of the 16-page Electrons and Ions article are available, including the cover, from Reprints Editor. Price is 50c.

(Continued on p 173)



FIVE 12-FT CUTS efficiently take the pit bottom from 5690 to 5640 level using rail haulage alone.

How the Bingham Pit Makes a Dropcut

V. S. BARLOW

ESTABLISHING A NEW LEVEL in the bottom of an open pit is not the simple job it may appear to be. Kennecott's recent project to open the 5640 level some 50 ft below the old bottom 5690 level demonstrates a highly perfected procedure which uses rail haulage alone.

Bottom area is a major limiting factor controlling the ability to establish a new level. Past experience indicates that an area 850 ft in diameter is required to begin dropcutting. This permits a 16 deg track curve at the start, and at no time will the curve exceed 22½ deg. If the dropcut were made in a smaller area, the sharp curves would greatly increase wheel flange wear on rolling stock, increase derailments and increase required locomotive tractive effort.

Considerable preparation must precede the start of excavation. A temporary, movable loading track must be laid and electrified in the bottom of the pit. This "loadline" is connected to the permanent level track and laid inside on a 16 deg curve for the complete circle and connects to itself at an "inner circle connecting switch." This allows dropcutting without interrupting other operations on the level.

Excavation of the first cut (see drawings) begins clockwise down a 3% grade, 60 ft wide along the inside of the loadline. When it is 12 ft below the starting point, or roughly 400 ft horizontally, a sump is dug. The cut then proceeds around the full circle, 60 ft wide at the bottom and 12 ft deep at the start but rising up a water grade of 0.25%. Near the end, the channel is narrowed somewhat to preserve a loadline switchback ramp. During this entire operation muck is loaded into cars on the first loadline (Track A in drawings).

After the first cut is finished the loadline and electrification towers are shifted 72 ft toward the center of the area, onto the first ramp and into the first cut (Track B in drawings). To preserve full circle haulage, the inner circle connecting switch is moved ahead, downgrade. This is necessary each time the loadline is shifted because the minus 3% ramp goes down 12 ft but the plus 0.25% cut rises back up only about 5 ft in making the full circle (about 1900 ft average). In practice the switch is moved to a point just beyond the sump.

The second cut begins inside the loadline near the first sump and runs clockwise, 60 ft wide down a 3% grade until it is 12 ft below the first cut and 24 ft below the original level. After a new sump is made, excavation proceeds around the full circle inside the track, 60 ft wide at the bottom, roughly 24 ft deep on a plus 0.25% grade and with muck being loaded into cars on the newly relocated loadline (Track B in drawings). Again the channel must be narrowed toward the end to preserve the ramp. Then the loadline and towers are shifted 32 ft further toward the center, onto the second ramp and into the second cut (Track C in drawings), and the switch moved ahead.

The third cut is more complicated because it is excavated on the outside of the loadline and directly under the first cut. Excavation begins back at the first sump. Here the bottom of the first cut is taken up going clockwise down a 3% grade. In effect this widens the previous ramp down to the bottom of the second cut. It is necessary to make a new ramp down to the bottom of the second cut because, as the third cut approaches completion, a portion of the previous loadline switchback track must be removed to allow full circle excavation.

The third cut continues past the second sump down on the 3% grade until it is 12 ft below the second cut and 36 ft below the original level. A new sump is dug and the cut proceeds around as in previous cuts. Near the halfway point, the channel is narrowed to preserve the ramp down from the original level. As the cut approaches the end of the ramp down to the bottom of the first cut, the loading switchback tract is shifted outward onto the new ramp and the third cut continues. A small amount of material that cannot be loaded at this time is cast aside with the shovel or moved with a dozer tractor. With the excavation completed, the entire loadline circle is shifted out into the third cut.

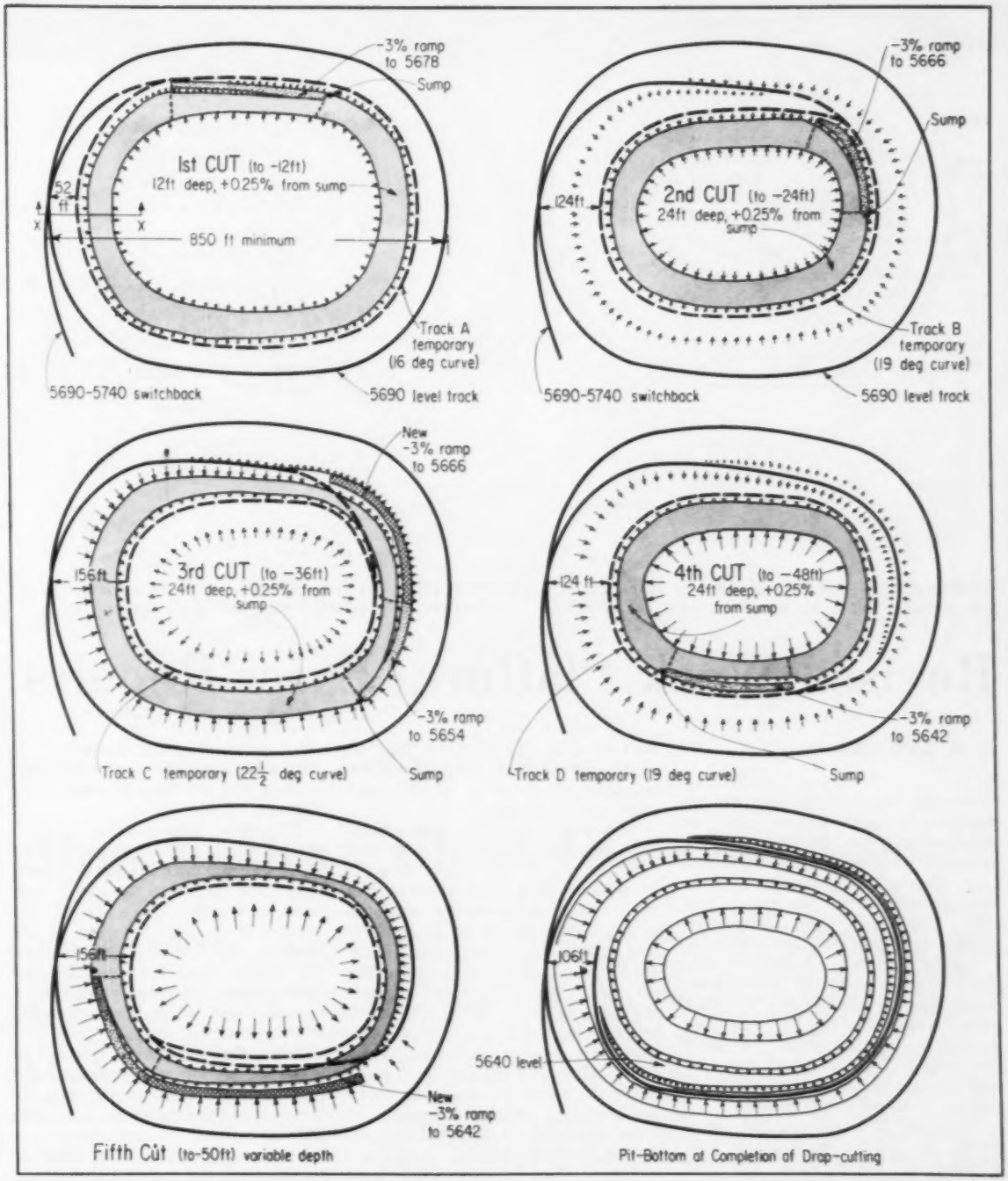
The fourth cut is similar to, and directly under the second cut. The fifth cut is similar to, and directly under the third cut. Completion of the fifth cut establishes the new 5640 level and from then on the operation is one of digging out the center island and enlarging the bottom to make room for another dropcut.

Shovel operations started on the new cut late in July and the fifth cut completed in April. Although it has taken nine months to complete, the operation can be done in considerably less time if necessary.

Drilling of 3-in. "down holes" was from the bench above the shovel using standard 4-in. percussion hammer drills mounted on self-sufficient crawler-tractor drill units. All holes were sprung and loaded with 65% semigelatin powder. Firing was with Primacord.

The shovel used was of 8-cubic yd capacity. This is the first time the mine used one of this size and re-

Mr. Barlow is superintendent of mines for the Utah Copper division of Kennecott Copper Corp., at Bingham Canyon, Utah.

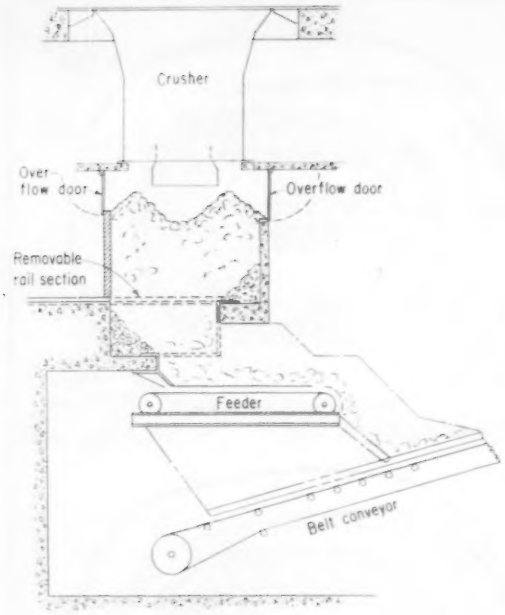


sults have been favorable. Greater dumping height allowed more flexibility in reaching the desired 50-ft depth in five cuts and was one of the main reasons for selecting the 8-yd unit. Prior dropcuts were made with 7, 6 and 5-cubic yard shovels but channel depth was limited to 10 ft with the 6 and 7-yd units and limited to 6 ft with the 5-yd unit.

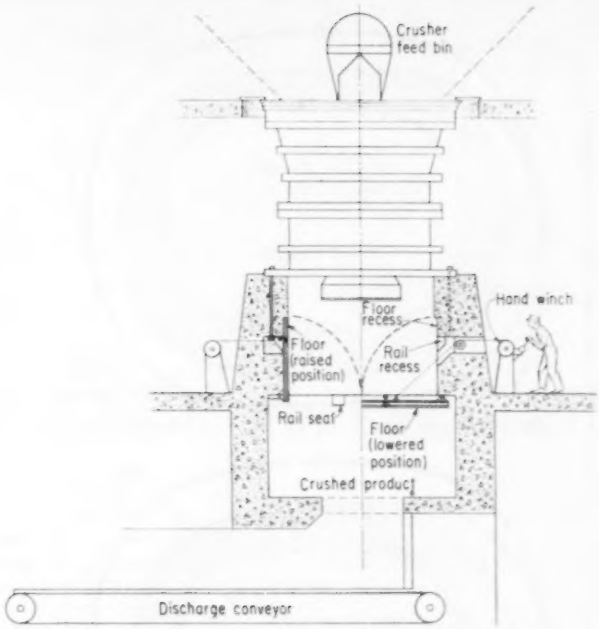
Electrification towers are positioned by either a railway or crawler boom-crane. Track is raised with mechanical track shifters, pulled down the bank with the rear winch on a dozer-tractor and realigned with mechanical track shifters.

Drainage control during descent of the shovel at the start of each cut is handled by a portable gasoline pump equipped with a flexible hose. Once a sump is dug, a semi-permanent electric pump is installed.

While dropcutting is completely different from day-to-day level operations and requires close control, it has been developed to such a degree that dropcut loading efficiency with the large shovel is on a par with the average performance of all other ore shovels. During early attempts at dropcutting it was impossible to even double-shift the shovel, and average loading was only about one-half normal shovel performance. Through a combination of improved drilling and blasting, larger shovels and elimination of dead-end track, a satisfactory operation has been developed.



OLDER UNIT'S dead material had to be removed from flat surfaces before the eccentric could be serviced.



ABSENCE of pockets and supports in new foundation design permits floors to be quickly lowered during cleaning or repairs.

Revised Work Platform Eases Repairs

L. M. ANDERSEN

GYRATORY CRUSHER SERVICE and inspection procedures can now be safely carried out by having a retractable working platform built into the foundation. Experience from typical installations has shown that this refinement has contributed greatly to improved plant operation.

Ideally, crushed product should fall to a combination foundation-surge bin for distribution to other plant components by a controlled feeder or belt conveyor, providing the circuit with constant tonnages and permitting most economical selection of screens and crushers.

A typical arrangement had space below the crusher serving the dual purpose of upper surge bin and headroom for removal of the eccentric mechanism. Surge capacity below the removable rail section also served as a converging hopper to the feeder. One of the closure walls, built at each end of the bin to retain material, was removable, a necessary arrangement for getting rid of those components which are removed from beneath the machine.

In addition, overflow openings were often provided directly below the crusher at each end of the closure wall so that any excessive build-up of crusher product would overflow, sounding an alarm as it fell away from the surge bin.

But even with these precautions, this foundation design let material build up on its flat areas to form an angle of dead material which had to be removed before the eccentric or other components could be serviced. Next step after clearing the dead material pile was to install the car rails, support beam and a plank working platform. When the rock boxes were packed solid, even short inspections became overly dangerous.

The Allis-Chalmers improved plant layout, to which a retractable working platform has been applied, is found applicable to any installation of bottom discharge crusher, 30x55 in. or larger. When the hinged floor sections are pulled up flush to fit the inside foundation wall, the large open area between crusher bottom and the discharge conveyor provides unrestricted storage space. The absence of pockets or supports, which might normally consume considerable cleaning time, permit the floors to be lowered immediately when required.

When up, the steel-lined underside of these floor sections protect the foundation by taking the abrasive wear of crushed material. The rails which accommodate the eccentric or other service cart are drawn up with the door, into the foundation bolt pockets and are fully protected from abrasive wear.

This new arrangement offers a simple, quick way to lower the platform and minimize production downtime. It's necessary to draw only enough product from below the crusher to permit lowering of the working platform itself. Cables used for raising and lowering the two floor sections can be worked by a service crane or a hand operating winch.

When the platform is lowered to working position, the extended car rails lower into slots provided in the foundation. (The cables used to lower and raise the floor sections do not have to support the heavy load of bottom plate and eccentric.) As soon as the working platform is lowered, the eccentric cart can be rolled into position through the foundation's hinged, metal side doors. The eccentric mechanism can be conventionally lowered (hydraulic jack and lowering rods).

Greater safety and speed is possible when changing or maintaining crusher components and, since it's no longer necessary to construct a work floor each time, inspections and preventive maintenance procedures can be made without delay.

Mr. Andersen is with Allis-Chalmers Mfg. Co.

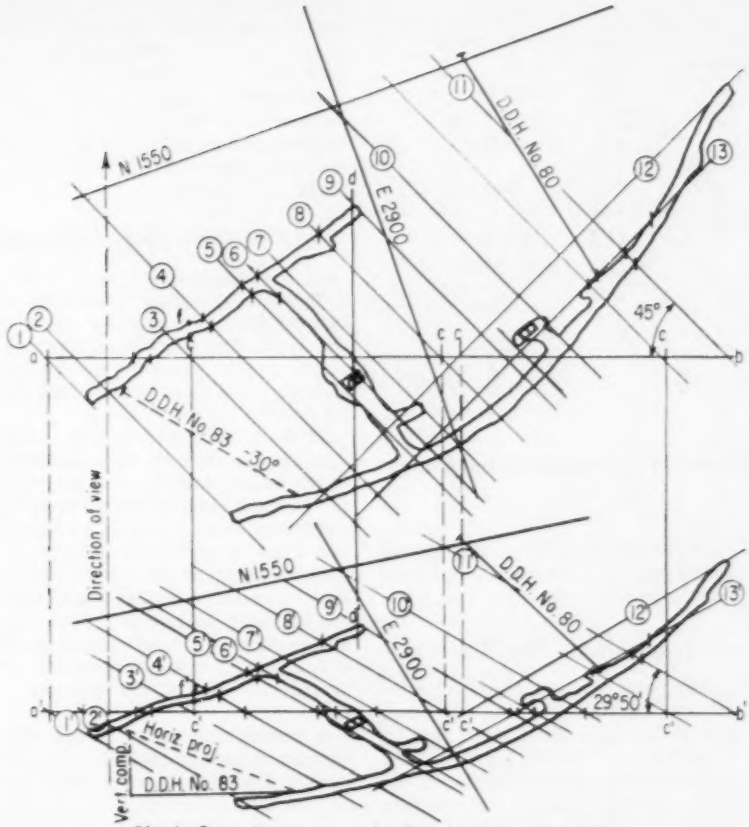


Fig. 1 Development of Inclined View from Plan

How to Draw Block Diagrams Easily

D. R. WILLIAMSON

THREE DIMENSIONAL TYPE DRAWINGS have not been fully employed by the mining industry because good construction has been too laborious. Some of the drafting methods, found even in textbooks, are basically erroneous and the approximation of the true picture which results is not desirable. With most older methods of construction the inclination of the direction of view is not a matter of choice. A few good drafting machines are available but most of them are inflexible; they require special tables; and they are too expensive, in any case, for most mining companies or individuals. Better techniques are needed because block diagrams are the best illustrations for many important features.

The orthographic projection described here is accurate, cheap, simple, rapid, completely versatile and, so far as known, original. No special setup or tools are needed and the drawing may be made as time permits without tying up large drafting areas. Plan map distances are not converted deliberately, hence use of the common laborious methods is avoided. Special skill in drafting is not necessary. In this method of construction a parallel direction of view is assumed for every point (Euclidean geometry or orthographic projection); no perspective is included.

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Drawing the Construction Lines

Fig. 1 illustrates the method used to develop an inclined view of a mine plan map. Initially, a direction and inclination of view are selected to best show the desired features. Then a print or tracing of each plan map is made on a sheet large enough to accommodate the inclined view above or below the plan view.

Next, a reference line is put on each map to identify the direction of view. All these lines should have the same bearing, and if they are placed in the same geographic position on each map they may be used as additional reference lines later in the construction.

Then, a base line, ab, is drawn perpendicular to the reference line. The base lines will be most useful in developing an inclined view of any plan if they are located to cut across a central part of each of the workings. Once again, if they are in the same geographic location, they aid later construction.

This is followed by drawing an inclined view of this base line in the space on the paper where the inclined view is to be depicted. This auxiliary base line, a′b′, is simply drawn parallel to the base line, ab, in approximately the same location relative to the two drawing areas.

Next, any number of diagonal construction lines are drawn, across the plan view at 45 deg angles with the base line, ab, to intersect the greatest

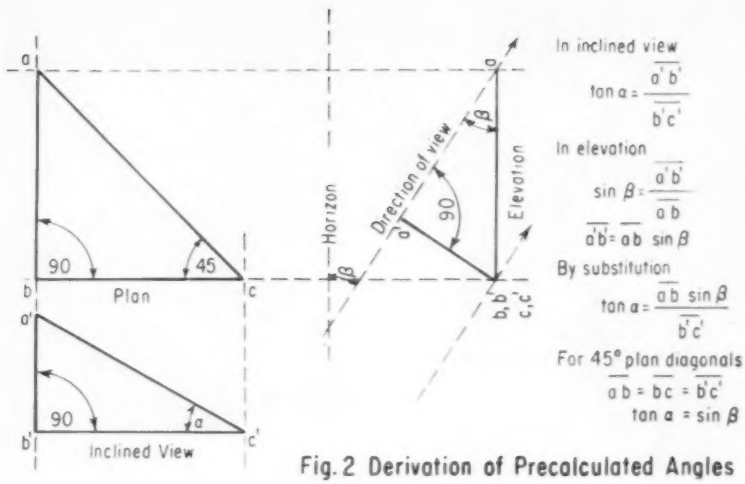

Fig. 2 Derivation of Precalculated Angles

amount of workings and/or key points. In Fig. 1 these diagonals are labeled 1 to 13; No. 12 and 13 show that they may be drawn inclined in either or both directions, whichever is most useful. Forty-five degree diagonals were chosen because they are most likely to make good, sharp intersections with the average set of ground lines and with the vertical construction lines that are drawn later. Diagonals other than 45 deg would be only rarely advantageous.

The intersections of these diagonals with the base line, ab, are then transferred to the auxiliary base line, a'b', by lines parallel to the direction of view. Examples in Fig. 1 are labeled c-c'. From the intersections on the auxiliary base line, a'b', the diagonals are reconstructed in the inclined view by drawing them in the same approximate direction as they are in the plan but at a special pre-calculated angle, α. This angle is smaller than the 45 deg angle of the plan view diagonals because of foreshortening caused by the inclination of view, angle β. In Fig. 1 these inclined view diagonals are labeled 1′ to 13′.

The angle of the inclined view diagonals is calculated by using the relationship $\tan \alpha = \sin \beta$ (see Fig. 2). In the example of Fig. 1, a minus 35 deg inclination of view was chosen; thus the angle of the inclined view diagonals is 29°50′.

Since the inclination of view is merely a matter of choosing any one that will depict the desired detail, if an angle of 35°15.9′ is chosen (rather than the 35 deg as in the example) drafting may be even simpler because $\alpha = 30$ deg and the common 30 deg triangle can be used.

Once these construction lines—the reference line, the base line, the auxiliary base line and the diagonals in both views—are drawn, the ground details can be easily transferred from plan to inclined view.

Transferring Plan Details

Any point where a ground line intersects the base line or a diagonal, can be located in the inclined view by a vertical line from such point to the corresponding construction line in the inclined view. Example points are labeled d and d′ in Fig. 1. Other example points are also indicated by vertical ticks.

Location of additional points may be simplified by use of proportional dividers. The dividers are set to convert distances by using any convenient point that has been located both in the plan map and in the inclined view. The distances must always be measured along a line in the plan which has been transferred to the inclined view and from a point common to both drawings. The most convenient lines are vertical construction lines. In Fig. 1, points d and d′ were used to set the dividers by measuring the distances from the two base lines, and points marked by the letter f were transferred to f′. The measurements can be made from any point and its counterpart; the sizes of most maps and of most dividers prevent always measuring from the base lines. Use of the dividers reduces the number of construction lines and time needed for accurate construction. Once the dividers have been set they can be used to measure the foreshortening only in the same direction.

When sufficient control points have been located, the plan map ground lines may be drawn in the inclined view. A little judgment in locating the diagonals and in making the most use of them and of their accompanying "verticals," will allow accurate construction from a minimum of lines and work. Other items on the plan map, such as coordinate lines or diamond drill holes, are located in the inclined view by transposing points where they are intersected by the construction lines. Acute intersections make poor points.

Adding Inter-Level Features

Most stopes, raises, winzes, diamond drill holes, and other items that lie between levels are properly a part of the block projection. Such items are placed on the plane of the inclined view by locating strategic points and by drawing between them.

If the items are vertical the procedure is quite simple. The connection of the item with the level is located in the inclined view by the methods described above, and from it a construction line is drawn up or down to suit the item being transferred. All vertical lines in the inclined view appear to be parallel to the bearing of the direction of view. The apparent vertical length of line is the true length foreshortened by the inclination of the direction of view.

A convenient method of determining the amount of vertical foreshortening is to lay off the true length of line on one of the verticals. The distance is measured off with the proportional dividers pre-set as described above; the shorter legs then contain the true, foreshortened distance.

If dividers are not available or if the distances are too large, the foreshortened vertical length, V_f, may be calculated by the relationship: $V_f = \text{cosine } \beta \times V$, where V is true vertical length.

If the items to be transferred are inclined between horizontal and vertical, the method is illustrated by the transposing of Diamond Drill Hole No. 83 in Figure 1. The collar and the end of the hole, as projected perpendicularly to the plan map, are transferred to the plane of the inclined view, by the methods described previously, for any point in that plane. From the end point in the inclined view a vertical is drawn down and the foreshortened length of the vertical displacement is laid off on it. The foreshortened length is determined by the methods just described. Connecting the two ends of the hole then give its true position and apparent length and inclination.

Some levels have such unusual gradients that appreciable differences in elevation occur. In flat-lying deposits, raises, winzes, and stopes often are shown on the plan maps and occasionally a stope sill or a sublevel is shown on a plan map although the

difference in elevation is appreciable. If the item is not so extensive that it warrants a separate drawing, it may be considered to be a part of the plan map during the first construction. After the inclined view of the part that is sufficiently close to the assumed general elevation has been penciled onto the block diagram, the inclined view of the whole is shifted up or down, parallel to the direction of view, so that any sills or sublevels will be at their correct foreshortened elevations. For inclined workings, individual points along their ground lines have to be located.

Transfer of Contour Lines

Fig. 3 illustrates the procedure used in transferring contour lines. The base line ab and appropriate diagonals are constructed and transferred to an inclined view by the method described. The base line and the diagonals on the plan map lie in a single, horizontal plane. In the previous constructions that plane was tacitly assumed to coincide with the plane of the plan map. For plan maps or irregular surfaces, however, there is no one elevation and some definite elevation must be assigned to the construction plane. That elevation applies also to the inclined view where the plane is represented by the auxiliary base line a'b' and by the foreshortened diagonals 1 through 8.

If the plane is assumed to have the elevation of the lowest point in the plan, or to have some lower elevation, all the points will lie on or above the plane, and the construction is easier to visualize. Actually the construction is more accurate and easier to draw if the construction plane is assumed to lie at the most important median elevation.

In Fig. 3, the plane represented by the construction lines was given the elevation of 5,925 ft; thus parts of the plan map lie above the construction plane and parts lie below it. Any point which exists in the plan map at 5,925 ft elevation is transferred to the inclined view exactly as described in the preceding sections. Examples are points e and e' in Fig. 3. The 5,925-ft contour line is reconstructed by sketching between transferred points.

Other points or lines lie above or below the construction plane; their depiction on the plan map are not only the actual points or lines but also their vertical projections to the horizontal construction plane regardless of the elevation assigned to that plane. Those *projections* may be transferred to the inclined view by the same method as before.

To locate the true positions of the points themselves in the inclined view, the proper distances are measured up or down (parallel to the direction of view) from those transferred projections. The proper distances are the foreshortened differences in elevation (vertical distances) between the points and the construction plane. They may be determined graphically or by the formula given above:

$$V_t = \cos\beta \times V.$$

Since a number of points of the same elevation are to be transferred, one calculation will suffice for all; any pair of dividers can be set to the foreshortened length to make the several measurements. Transfer of such points is illustrated by f' and f'' in the drawing of Fig. 3.

It must be kept clearly in mind whether a point is on, above, or below the construction plane and whether it is the final point or merely an intermediate point used for construction. When sufficient points are transferred to their true locations in the inclined view, a line is reproduced by sketching between them.

In the usual case some of the surface features shown by lines in the plan map will lie behind some higher part or behind a part which is closer to the foreground. Since they would be out of sight if the area actually were viewed from the same position as the drawing is being constructed, they should not appear in full line in the final drawing. Several such contour lines are absent in the inclined view. The highest points and those nearest the foreground should be projected first to forestall confusion.

To give the inclined surface a better appearance, a vertical plane (cd, c'd') or combination of planes similar to that in Fig. 3 may be constructed and cross hatched.

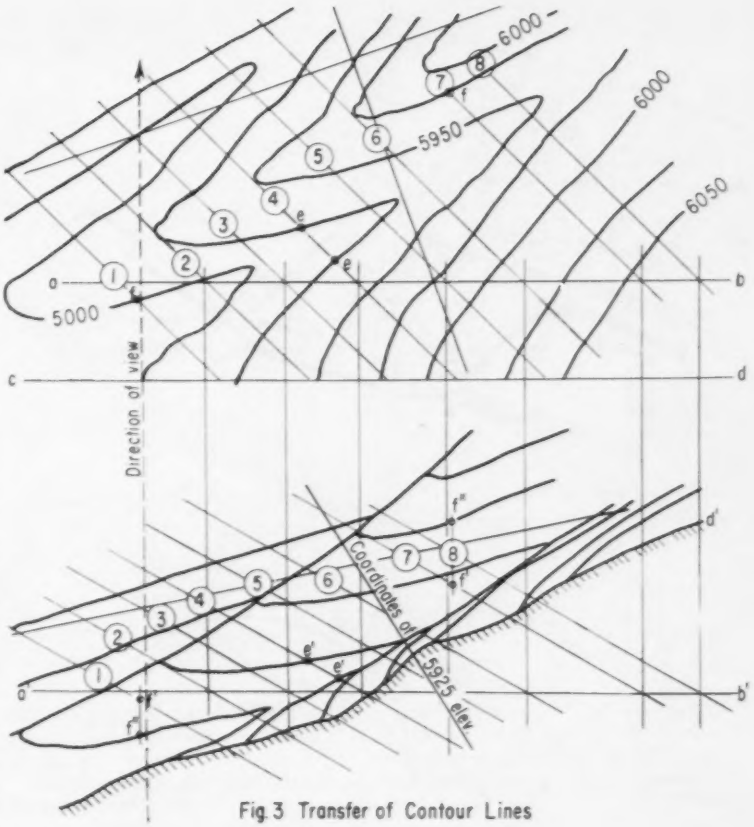

Fig. 3 Transfer of Contour Lines

Assembling Inclined Views

The various inclined views are assembled into a block diagram most easily when the same reference lines exist in their correct positions on each of the drawings. The references may be the lines showing the direction of view, the base lines, coordinates, etc. Mine maps commonly have the same coordinate lines on each plan; they are the best reference lines because they are permanent. A vertical shaft is a handy, easily understood reference. If no common reference exists, some must be inserted and carried from one level to another.

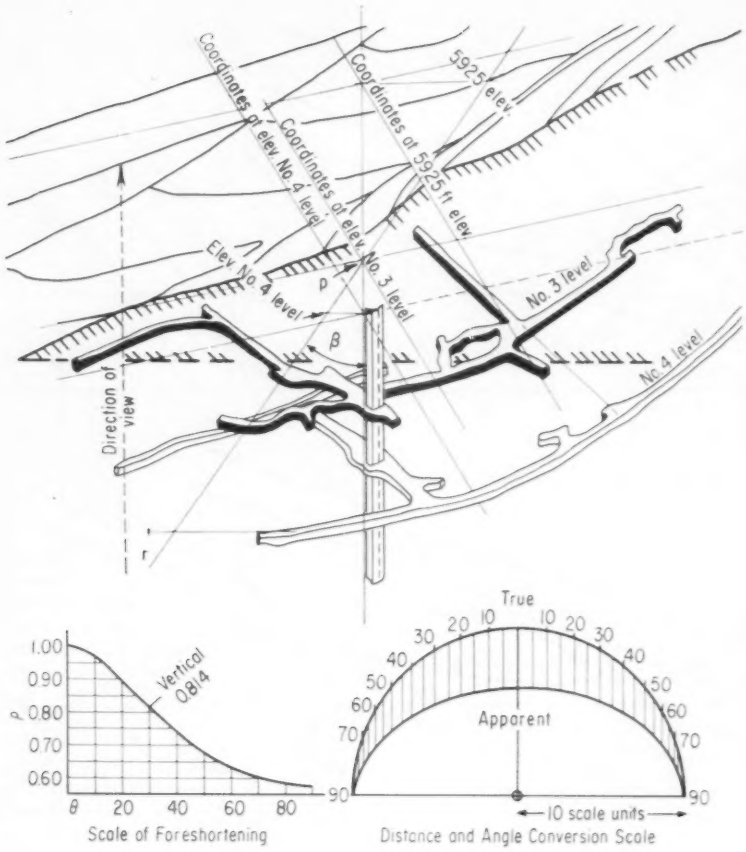

Fig. 4 Assembling Inclined Views

For this purpose a suitably large rectangle may be placed on the plan maps with ends parallel to and sides perpendicular to the direction of view line. The base of the rectangle should coincide with the base line, and in the inclined view the ends should be foreshortened according to the formula: $H_f = \sin \beta \times H$, where H_f is foreshortened and H is true end.

Fig. 4 illustrates the assembling of inclined views of several levels by using the same coordinates at the correct elevations. The intersection of the coordinate lines, p, being on each level, is taken as the starting point for assembling the views.

On the blank block diagram sheet, a vertical line is drawn through point p. In the diagram this is always parallel to the direction of view. A construction line p-r is drawn from the same point, at an angle with the vertical equal to the inclination of the direction of view (35 deg in the illustrations).

On construction line p-r the differences in elevation (or the true track elevations) of the various levels are marked off with the same scale to which the original plan maps were drawn. From each point thus determined, a construction line is drawn perpendicular to the direction of view until it intersects the vertical "p" line; points thus determined on the "vertical", mark the intersections of the coordinate lines at the foreshortened elevations of the different levels.

One set of the coordinate lines are traced onto the block diagram from one of the previously constructed inclined views. The coordinates for each level are then constructed by drawing lines from the previously determined elevation-points parallel to the first coordinate lines.

Each inclined view of a level is now oriented in the block diagram by overlaying the correct set of coordinate lines on the block diagram sheet onto those that are on the previously drawn inclined view of the level. Next, the ground lines are traced onto the sheet of the final diagram *in pencil*.

Additional items such as diamond drill holes and raises are added last.

The draftsman should start with the uppermost level and should work progressively downwards so that overlap of workings will be found systemically.

The third-dimensional effect is increased so greatly by building up the workings from the ground line that the block diagram cannot be considered as finished until that is done. The construction is easiest to make when the inclined view of the plan is assumed to have the elevation of the track. The level is assumed to be horizontal. A few small rectangles are erected at critical points on the ground line to represent cross sections of the workings. The height of the workings must be suitably foreshortened, and the rectangles should be drawn at right angles to the general direction of the workings. The rectangles are then connected by pencil lines and the level is inked to show those parts of the workings that would be visible from the point of view selected.

The third-dimensional appearance can be further emphasized by shading certain sides of the workings as though the light were coming from above and from one side.

Of course, if the plan maps used in the construction are on a small scale, less than one inch to 100 ft, little is added to the effect either by erecting the sides of the ground lines or by the shading.

The inclined view of the surface is incorporated into the block diagram by reproducing the inclined plane, upon which it was constructed, in its true position in the framework. The foreshortened elevation point is laid off on the construction "vertical," as described before, and the coordinate lines are drawn parallel to the others. When the drawing of the block projection is oriented over the inclined view of the surface, the desired data may be traced. The inclined construction plane, the horizontal dashed and shaded line, may or may not be a part of the final drawing.

The final drawing should include a note stating in which direction and at what inclination it was constructed, and some permanent reference lines should be retained to facilitate revision.

Scales

Distances in the drawing, other than those perpendicular to the direction of view, are foreshortened to varying degrees and no common scale is usable. The only solution to the problem in the past was the incorporation of bar scales which were usable only for lines parallel to the bar scale.

A direct, geometrical relationship exists between the amount of foreshortening of a line in a block diagram and the position it occupies with respect to the direction of view. The relationship of an inclined view of a

circle is shown in Fig. 5. From the polar equation for ellipses,

$$\rho^2 = \frac{b^2}{1-e^2\ (\cos\ \theta)^2},$$

the following equation may be developed for horizontal lines:

$$\rho^2 = \frac{(\sin\ \beta)^2}{1-(\cos\ \theta)^2+(\sin\ \beta)^2\ (\cos\ \theta)^2}$$

where ρ=decimal fraction of foreshortening, β=angle of inclination of direction of view, and θ=acute angle between line being measured and a line perpendicular to direction of view.

Each block projection has a definite, constant value of β which may be substituted into the formula, and a curve may be constructed to show the relationship between the two remaining variables. For the example in this paper, $\beta=35°$ and the relationship becomes:

$$\rho^2 = \frac{0.329}{1-0.671\ \ (\cos\ \theta^2)}$$

Applying a number of assumed values for θ from 0 to 90 degrees gives a corresponding set of decimal fraction values for ρ and a curve is drawn as shown at lower left in Fig. 4.

The true length of any *horizontal* line is determined by first measuring the actual length on the drawing with the same scale to which the original plan maps are drawn. Then the acute angle is measured between the line and any line that is perpendicular to the direction of view. Next, the decimal fraction of foreshortening which corresponds to that angle is read from the graph and finally the measured distance is divided by it. The result is the true distance represented by the line on the block diagram regardless of its bearing. It is accurate to the limits of the projection.

Of course, as an alternative for those who find it easier to multiply than divide, the reciprocal of ρ can be calculated and graphed instead.

The graph of decimal fractions or "scale-curve" should become a permanent part of the block diagram; since the method of measuring is new, a short explanatory note on the diagram will be necessary to explain its use.

A normal-sized block-diagram really is a sizable drawing and its "scale-curve" also may be sizable without becoming out of proportion. More than adequate accuracy may be expected from a well drawn curve of appropriate size.

All *vertical* lines in any given block diagram are foreshortened the same fractional amount. The true lengths may be determined by: dividing the foreshortened length (measured with the scale to which the original plan maps were drawn) by the cosine of the angle of inclination of the direction of view. It is also handy to have this value indicated on the diagram, e.g., on the scale-curve at lower left in Fig. 4.

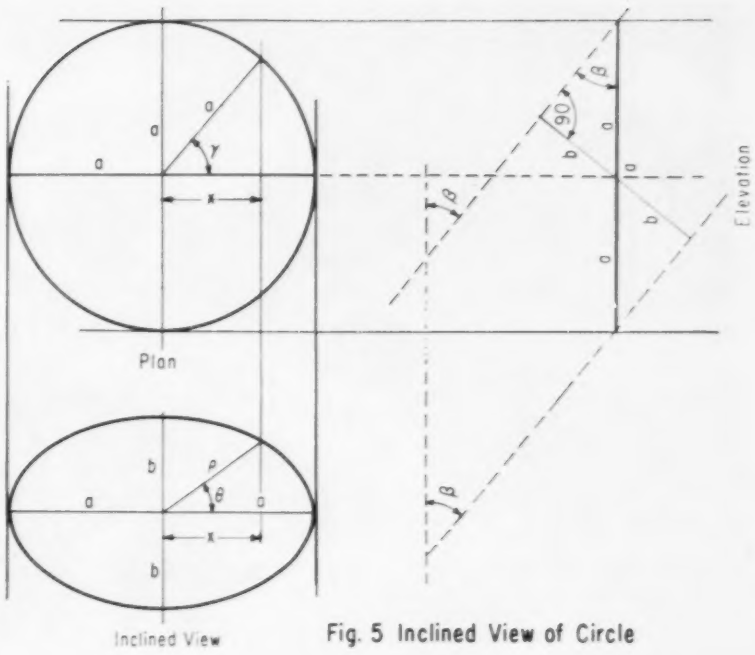

Fig. 5 Inclined View of Circle

Unfortunately, the true length of *inclined* lines, other than vertical ones, can be measured only by determining the horizontal and vertical components and by calculating the distance by the square root of the sum of the squares method.

Bearings are likewise foreshortened. From the plan and the inclined view of Fig. 5, the reader will see that any radius of the circle is represented by a ρ in the ellipse. The angle γ becomes foreshortened to θ. Consequently there is a direct relationship between the inclination of the direction of view and the foreshortening of angles.

From Fig. 5: $\cos\ \gamma = \frac{x}{a}$, and $\cos\ \theta = \frac{x}{\rho}$

Upon assuming $a = 1$, ρ becomes a decimal fraction of 1.

Combining the above equations

$$\cos\ \gamma = x$$

$$\cos\ \theta = \frac{\cos\ \gamma}{\rho}$$

$$\therefore\ \cos\ \gamma = \rho\ \cos\ \theta$$

Thus it is possible to measure θ, multiply the cosine by the decimal fraction determined from the graph, as in lower left Fig. 4, and the angle γ will be the angle whose cosine is the final figure. From that angle and knowing the direction of view one may quickly determine the true bearing of any line that appears at any angle in a horizontal plane in the block diagram.

Since scaling measurements off any diagram is not highly precise, a simple graph may often suffice for determining both true horizontal distances and true horizontal bearing. Several schemes may suggest themselves to the reader. One example is shown in the lower right of Fig. 4. The graph is simply the concentric plot of half of the ellipse and half of the circle shown in Fig. 5. The radius of the circle should be some multiple of 10 units of the scale of the original plan view. The decimal fraction by which apparent distances should be divided is the scaled distance from the center of the circle to the ellipse when the scale is held parallel to the apparent direction on the block diagram. The true angle from the direction of view is indicated on the circle vertically above the point of intersection of the apparent direction and the ellipse.

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(Ed—Mimeographed copies of the "Proof of the Correctness of the Method", prepared by Mr. Williamson, are available from *E&MJ*.)

BURROS CARRIED crude ore from the mines, which were mostly situated many hundreds of feet above the San Miguel River, down steep, winding trails to the concentrator established at Joe Junior by Standard Chemical Co., Coke Ovens, Colo.

Early Carnotite Mining in Colorado

KENNETH C. NICHOLSON

IN 1914, WHEN THE AUTHOR first started to work as a chemist for Standard Chemical Co., Canonsburg, Pa., most of the mining and concentrating of carnotite ore in southwest Colorado was being done by Standard Chemical Co. The concentrating mill was located on the banks of the San Miguel River about three miles or so upstream from the junction of the San Miguel with the Dolores River. At that time the site was called Joe Jr. Camp—it is now Uravan. Joseph J. Flannery, Pittsburgh, Pa., was president of Standard and the camp was named for his son, Joseph J. Flannery, Jr. Mr. Flannery also founded the American Vanadium Co., which owned a deposit of patronite vanadium ore in Peru, the richest vanadium deposit then known.

STANDARD CHEMICAL CO. produced the one gram of radium presented to Madame Curie (above) by the Women of America on her 1916 visit to Canonsburg.

In addition to the mines and concentrating mill at Joe Jr. Camp, Standard Chemical Co. had headquarters at Coke Ovens, near Naturita, Colo., about 20 miles from Joe Jr. Camp. Some of the mines near Joe Jr. being worked in 1914 were Club Camp, Dolores Camp and Hieroglyphic Camp. There were a number of claims also being worked by independent miners.

All supplies for the camps were hauled 60 miles from Placerville, the nearest rail point, by freighters with four- and six-horse teams drawing two wagons in tandem. Since the road along the San Miguel River from Naturita to Joe Jr. was non-existent, the freighters had to go through Nucla and eventually came to the San Miguel near the camp by way of a very steep road down Tabeguache

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Hill (pronounced Tabbawatch). Concentrates from the mill were hauled out by the same route and shipped to the separating plant at Canonsburg, Pa.

Crude ore from the mines, which were mostly situated many hundreds of feet above the San Miguel River, was transported on the backs of burros and mules down steep, winding trails to the concentrating mill. Since there was little or no water at most of the mines, the water supplies were carried up the same trails by burros.

A burro puncher on his horse might have 15 to 20 burros, each loaded with three sacks of ore, strung out along the trail ahead of him. Burros usually picked their way carefully and followed the trail. In the case of mules, the mule skinner had to lead his string of mules in single file, each tied to the one ahead. A mule could be led but not driven.

Carnotite was usually disseminated throughout a porous sandstone; chemically it is potassium uranyl vanadate. Since uranium is the parent of radium, the ore contained its quota of radium. There were then, the three metals, radium, uranium and vanadium to be recovered from carnotite ore.

In 1914, the ore was mined and treated for the radium content; vanadium and uranium were by-products. If a crude ore did not have a minimum of about 1.0% U_3O_8, it was not considered rich enough to send to the mill. Ore was crushed and fairly finely ground and then passed through air separators which separated the coarse sand from the fine carnotite powder—at least that was the idea. However, so much of the sand was ground fine that much of it went along with the carnotite. A 1% U_3O_8 crude ore would yield about 3.5% U_3O_8 concentrate.

Later a wet concentration method was used to float off the fine carnotite concentrates which were then recovered by filter presses. These concentrates were not much higher in U_3O_8 content, probably 4.5% U_3O_8.

A small canal which paralleled the San Miguel River for several hundred yards led water from the river to a power house where a water-powered turbine drove a generator to supply electric power. Total fall at the wheel pit was about 18 ft.

The San Miguel River was always full of silt, which originated from the fine tailings from gold mining operations at Telluride, about 100 miles upstream from Joe Jr. Camp. For camp water supplies this muddy water was pumped into settling tanks to permit the silt to settle before it could be used.

Much of the water carried to the camps, which were high above the river, was used for the core drills prospecting for new pockets of ore. The water was used to wash away the cuttings from the drill head. One experiment was made at Club Camp to use a dry core drilling method. An air compressor was installed with the idea of blowing the fine rock cuttings away from the cutting head of the drill by means of a jet of compressed air. This method was soon abandoned.

A chemical laboratory, situated in a small frame building in the center of Joe Jr., provided service for control of the concentrating mill, analysis of ore samples from the operating mines, for prospectors' samples and for samples from assessment work on claims.

The U_3O_8 content of heads, concentrates and tails from the concentrating mill, at the time air separation was used, was estimated by means of an alpha ray electroscope. This method was subject to many errors but it was a fast method. In damp weather the natural leak of the instrument became erratic and it was difficult to charge the electroscope. When the weather was damp and the smell of sagebrush was quite noticeable, the chemist knew he would have trouble with the electroscope.

Fortunately, it was usually dry at Joe Jr. Camp.

Going to the Dentist

Life at Joe Jr. was not too exciting during the period 1915 to 1917. Employees worked seven days a week. In fact, the miners insisted on it. There were few automobiles, no place to spend money and the $1.00 per day charge for board continued whether a man worked or not. A man's pay accumulated until it began to burn a hole in his pocket. Then he would take time off to go to Telluride to "get his teeth fixed." After a couple of weeks there, he would return to camp, often without having his teeth fixed and generally without any money. Then he would go back to work to accumulate another stake.

Colorado was "dry" then, so that bootlegging of liquor was commonplace. A freighter would bring in a quantity of liquor and cache it in Hieroglyphic Canon near the camp. The men in camp would chip in to pay the freighter. Then, by ones and twos, the men would slip out of camp with an empty bottle and return with a full one.

Home brew was also made. One concoction was made from fermented canned peaches. After fermenting, it was filtered. This was known as "rip gizzard."

Since there was little to do in camp in the way of entertainment, elaborate practical jokes upon some greenhorn from the East were sometimes arranged.

A young civil engineer, recently arrived in camp was made the butt of one joke. Everyone in camp except the victim was let in on it and a period of three days was taken to bring it to a climax. A freighter one day announced that he had captured a badger which he had confined in a barrel in the burro corral.

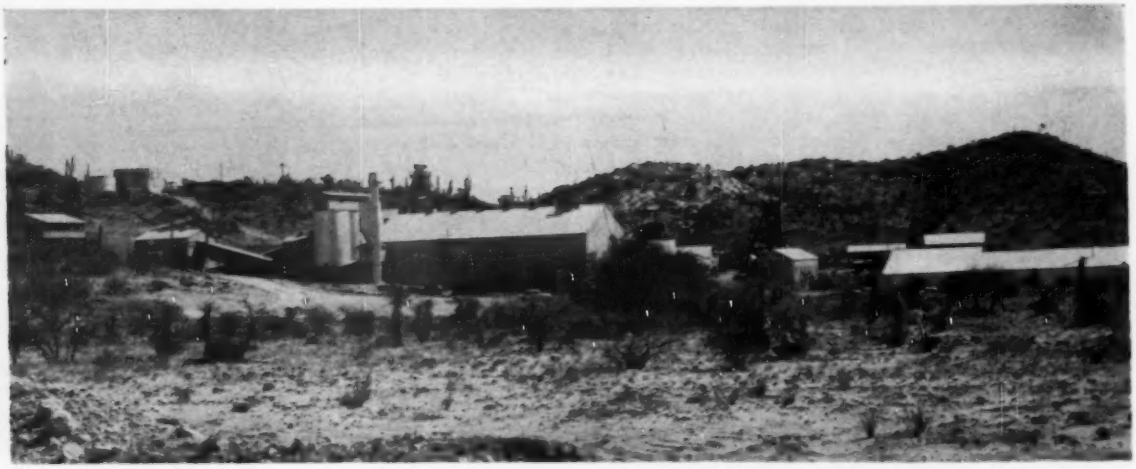
An Old Badger Game

The men at the mine had dogs so they began to talk up a fight between a dog and the badger. Betting was rampant, some betting on the dog and some on the badger. On the third day the whole camp went to the corral and perched on the fence to watch the fight. When it came to choosing someone to drag out the badger from the barrel by a rope, presumably tied around his neck, there were objections to anyone that had a bet on the fight. It soon appeared that the young engineer was the only one who had not bet, simply because nobody would bet with him. Therefore, he was chosen to pull the badger. He took hold of the rope and was told to run as fast as he could when the cover was taken off the barrel. A man in front was holding the dog and excitement ran high. At the signal the engineer ran, and, bouncing along behind him was a metal chamber pot. A roar of laughter went up which the victim probably remembers to this day.

During the period of operation by Standard Chemical Co. radium was the chief product. It then sold for $120,000 per gram. Vanadium was converted to ferrovanadium at the Canonsburg plant. It found a ready market for use as a steel-making alloy. The only use for uranium was as a ceramic and glass coloring agent. Fairly large quantities of uranium in the form of sodium uranyl carbonate accumulated. Attempts to make a uranium containing steel were not too successful.

With the discovery of the rich deposits of high grade uranium ore in the Belgian Congo in the early 1920's, the price of radium dropped to $70,000 per gram. Low-grade Colorado carnotite deposits could not be operated at a profit and Standard Chemical Co. ceased operations a few years later—just 20 years too soon for the atom bomb and nuclear power uses for uranium.

Standard Chemical Co. produced the one gram of radium presented to Madame Curie by the Women of America on the occasion of her visit to the U.S.



BANNER MINING CO. has had to cut back mine production at its three underground mines. The flotation mill (above) is taking ore only from the Daisy Mine (450 tons); and Mineral Hill, (headframe, right) and the Copper Glance are on standby.

Pima's New Copper Mines Forge Ahead

CONTINUED EXPLORATION of new areas by diamond drilling and active development of a large open pit, and construction of a 10,000-tpd copper concentrator highlight current activities in the Mineral Hill-Twin Buttes mining districts, 20 and 30 miles southwest of Tucson, Ariz., visited by *E&MJ* in March. The area promises to become one of the largest copper mining fields in the U.S.

Reserves drilled out since discovery of the Pima mine by geophysical methods (see *E&MJ*, March 1958) in 1950 are estimated at more than 200-million tons assaying from 0.65 to 1.75% copper, distributed between the four principal operators active in the districts — American Smelting & Refining Co., Banner Mining Co., Duval Sulphur & Potash Co., and Pima Mining Co. Here is a brief roundup of what is going on at the different properties and mineral holdings.

American Smelting & Refining Co. Extensive diamond drilling operations are in progress at the company's East Pima and San Xavier projects covering several square miles of mineral holdings 20 miles southwest of Tucson. The area is completely covered by a 200-ft layer of alluvium, and mineralization found so far consists of disseminated chalcopyrite and pyrite in hydrothermally altered sedimentary rocks and porphyry. As a consequence, preliminary drilling started on a modest scale in 1954 on the East Pima. Project was done on wide-spaced intervals of scout drilling to check geophysical anomalies.

Drilling was gradually stepped up and a drilling grid was developed as geological and geophysical information was accumulated and charted. Considerable geophysical work was extended into the recently acquired San Xavier holdings. The two-compartment shaft currently being sunk in the East Pima area will aid underground exploration of mineralization disclosed by previous drilling and provide bulk samples of ore for metallurgical investigation.

Current drilling is done with Joy truck-mounted diamond drills using NX bits. The drilling technique developed results in core recoveries ranging from 85 to 90%. Open pit exploitation of developed orebodies is being studied.

Banner Mining Co. Low copper prices have forced the company to cut back production from its three underground mines and institute a 40-hour week for miners. Daily tonnage now handled at the 900-ton flotation mill at Mineral Hill is 450 tons, most of it being mined in the Daisy mine a short distance from Pima's pit.

Copper Glance mine, which was developed to add about 200 tpd to the 600 tpd combined output of the Mineral Hill and Daisy mines, has

AMERICAN SMELTING & REFINING CO. is sinking a two-compartment shaft on its East Pima property to facilitate underground exploration and ore sampling.

DUVAL SULPHUR & POTASH's concentrator looked like this at the time of *E&MJ's* visit. Primary crusher will be at center, two-stage fine crushing at left.

B. G. MESSER, assistant resident manager, chats with Isbell's super.

been shut down. Extensive exploration drilling has been carried out during the past two years and is still in progress at the present time.

This work has substantially expanded the size of known disseminated copper orebodies. The mill is operated five days a week. Backfill for the Daisy mine is now obtained from the batching plant at the Mineral Hill mine handling deslimed mill tailings. Material is transferred to the Daisy via a 3-in. pipeline about 4500 ft long. Selection of the small-diameter pipe resulted in higher rate of flow and consequent reduced danger of pulp settling in the pipe.

Duval Sulphur & Potash Co. Development of the large open pit and construction of a new 10,000-tpd concentrator at the company's Esperanza property 30 miles southwest of Tucson, involving a capital outlay of some $20-million are proceeding on schedule. The mine holdings were acquired more than three years ago on recommendation of Dr. Harrison Schmitt after comprehensive geological examination. Since then the company has applied for 88 patents.

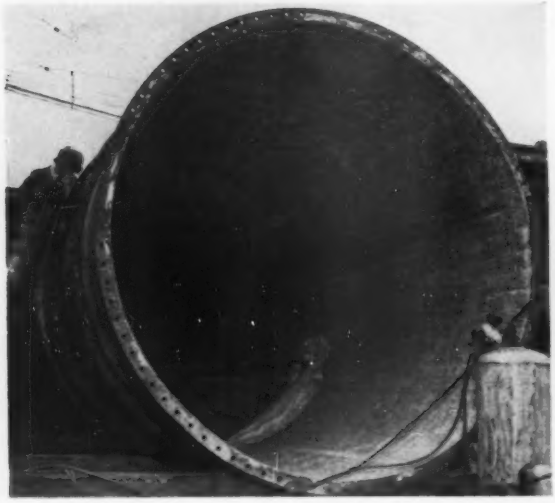
Exploratory churn and diamond drilling started soon after acquisition of holdings was carried out on a 500-ft equilateral pattern. About 90 holes were drilled, disclosing a disseminated low-grade ore zone. Chief copper minerals contained therein are chalcocite and chalcopyrite, with a small amount of molybdenite. The orebody is from 80 to 300 ft thick, averaging 100 ft of overburden. To reach the ore zone, about 5-million tons of overburden will have to be removed. The pit will be oval in shape, eventually measuring 3600x 2800 ft. Stripping operations were started by Isbell Construction Co. on Nov. 1, 1957.

A large part of the overburden currently stripped is being used for fill required to establish the one-mile main haulage road leading from the pit to the primary crushing plant. Stearns-Roger started active work on the new concentrator in June 1957 which will include three-stage crushing, open circuit grinding in rod mills, secondary grinding in ball mills in closed circuit with cyclones, conventional flotation, thickening and filtering of concentrates, and molybdenum recovery. Copper concentrates will be shipped to the Asarco smelter at Hayden, Ariz. Access to the property is now afforded via a new 7½-mile road branching off the main Tucson-Nogales highway south of Sahuarita.

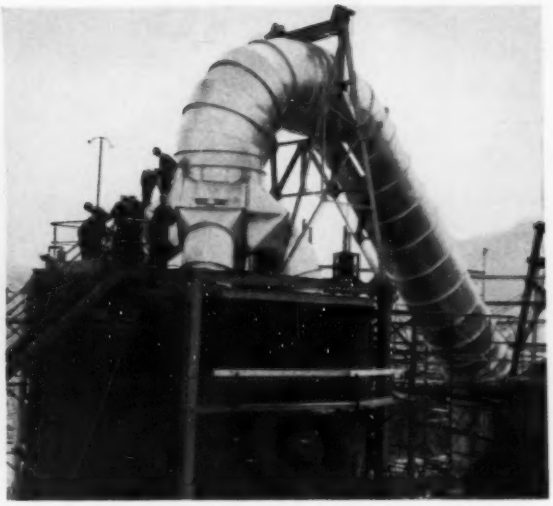
DUVAL's ESPERANZA PIT has progressed this far in late March. About 5-million tons of overburden must be removed to supply the 10,000-tpd concentrator.

Pima Mining Co. Capacity production is being maintained at the pit and concentrator, though the work week at the mine has been reduced from 48 to 40 hour. The concentrator handles more than 3000 tpd. Save for installation of more rougher machines to double the capacity of the rougher flotation section to provide longer contact time and improved metallurgy, milling operations follow closely those described in *E&MJ*, March 1958.

At the pit, tests are being conducted with fertilizer-grade ammonium nitrate in primary blasting operations. A new semi-automatic truck dumping installation is now in use at the foot of the rockover skip system tracks.



THE 9x8 FT steel flue sections (lead-lined to combat corrosion) are welded into 50 ft units before shipment to plant.



AT SINTERING PLANT, flue-carried gas enters top of 50 ft spray tower through four circular ports at a rate of 3,000 fpm.

Lead Lining Stops Flue Gas Corrosion

DURING THE CONSTRUCTION of its new smelting works at Trail, B. C., and while planning a new sintering unit, Consolidated Mining & Smelting Co. of Canada ran up against the problem of providing an efficient and leak-proof gas handling system to operate between the sintering plant and electrostatic dust precipitator.

Cominco's former setup was an obsolete flue-humidifying chamber system containing water sprays to cool and condition gases before treatment in the dust precipitator. The flue, 15x24 ft in cross section, was wood with gunite on exterior surfaces, while the humidifying chamber had concrete walls and wooden roof over an area 60x300 ft. System's over-all length was about 400 ft, and operated under a low draft. Inward air leakage seriously diluted the gases, contributing to a considerable increase in volume to be treated for dust separation and SO_2 recovery.

When they designed the new sinter gas handling facilities which went into operation in May 1957, company experts carefully considered corrosion problems. The flue operates at 350 deg F and carries gases containing up to 3% sulphur dioxide and a heavy burden of dust. In the normal operating cycle, it is cooled down once a day, resulting in a condensation on the inner walls.

Because the condensation was highly corrosive, the main problem became that of choosing the proper building materials. A variety of combinations was considered, including stainless steel with mild steel either insulated internally or lined with masonry, glass or enamel. Conventional lead sheet construction was ruled out—temperature and pressure cycle would rapidly cause failure through creep and fatigue. The final decision, based on experience with sinter gases, was to use steel construction, clad internally with lead.

Cominco's present installation consists of a 9x300 ft steel flue and a spray tower 30 ft in dia and 50 ft high. Gas enters the tower top through four circular ports and is immediately subjected to a 300 psi water spray. The number of sprays is automatically controlled by gas temperature. Water volume is from 20 to 50 gpm, and flue gas velocity is about 3,000 fpm.

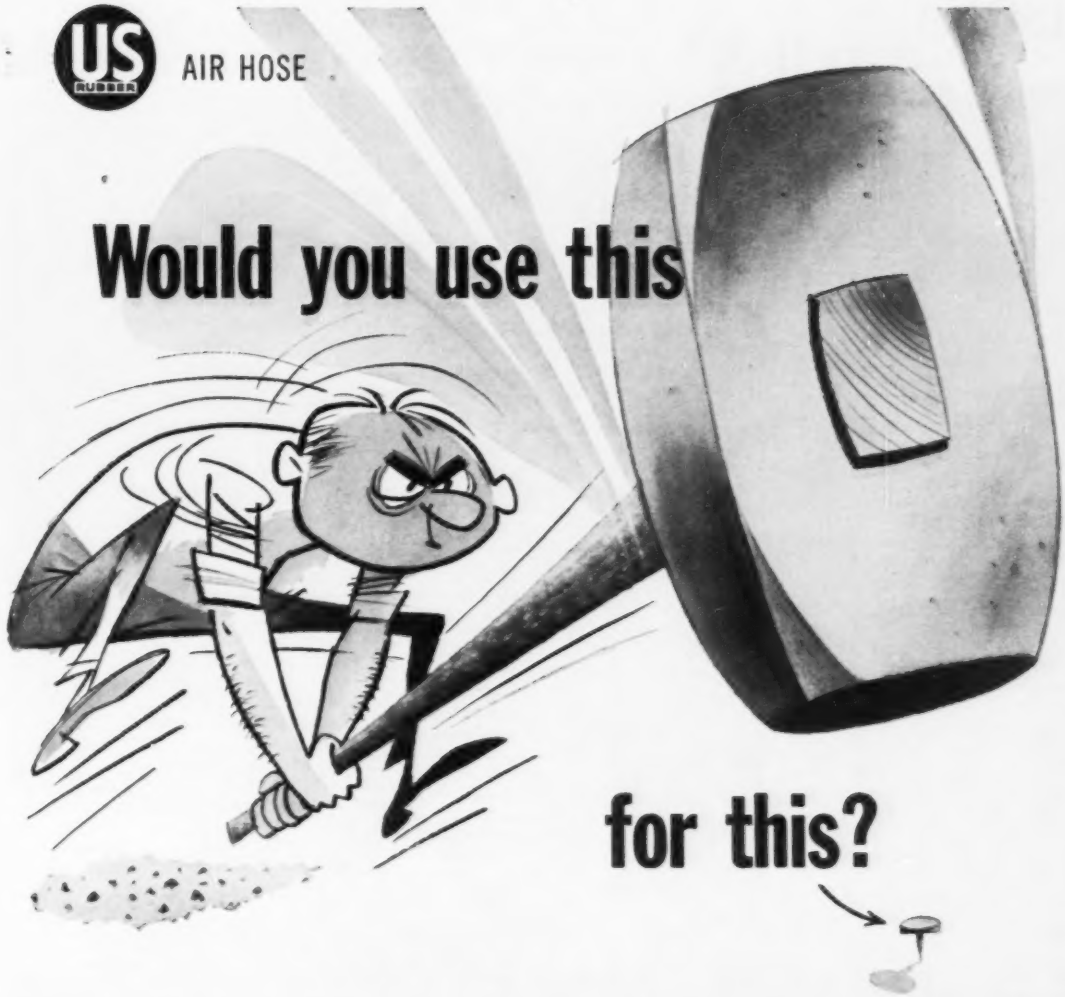
Lead cladding was applied to the cylindrical flue sections (each 9 ft in dia and 8 ft long) in the following manner. First, the internal surfaces of these units were cleaned, fluxed, and then given a first coating of lead by rotating in a shallow bath, so that the steel surface dipped into molten lead. No lead adhered to the unfluxed external steel surface. The main coating of lead, about 10 lb per sq ft, was then applied, using equipment and methods developed by Knapp Mills Inc. The 9x8 ft flue sections were then welded into units about 50 ft long, and the internal lead cladding applied over the welded joints by hand burning. Each 50 ft section, in turn, was fitted with end flanges before being shipped to the erection site. Here, the flanges were bolted up, and the cladding over the joints burned together in position.

The spray tower was constructed of lead-clad mild steel supported by a concrete sill and base. All mild steel plates were clad before construction, each plate being spot-welded to form a cylinder, then closed, fluxed and clad in the same way as the flue sections. The plates were then flattened out, cut to size, and welded in position. Vertical walls of the lower concrete part were protected by 12 lb sheet lead welded to vertical supporting strips inserted in the concrete. The tower floor was protected by sheet lead placed over the concrete after application of an intermediate asphalt dressing. This lead flooring, in turn, was shielded by a course of acid-proof brick against the possibility of mechanical damage if cleaning out of accummulated sludge should be necessary.

Cominco's unit is one of the largest single lead-clad steel jobs ever done (total weight—about 200 tons). Operating data for the new flue-spray tower system: gas strength, percent SO_2 at treater outlet, 1.8; gas volume at treater outlet, cfm at 115 deg F, 140,000. Comparison figures covering the old flue and chamber system are 1.1 and 220,000. Installation's design and construction were both carried out by Cominco while Knapp Mills Inc. supervised the lead-cladding operations.

US RUBBER AIR HOSE

Would you use this



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Every hose in the complete "U. S." line is designed to give maximum service, even under unreasonable demands. Take advantage of the skill and long experience of "U. S." Hose technicians, plus "U. S." research and production facilities. Get U. S. Air Hose at your local authorized "U. S." Hose Distributor, or write us at Rockefeller Center, New York 20, New York. In Canada: Dominion Rubber Co., Ltd.

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PERSONALS

Weed

Brinckerhoff

Clyde E. Weed, formerly president, was elected chairman of the board and chief executive officer of Anaconda Co., Chile Copper Co., Chile Exploration Co. and Andes Copper Mining Co., succeeding the late Roy H. Glover; and **Charles M. Brinckerhoff** has been elected president and director of Anaconda, and president of Chile Copper Co., Chile Exploration Co., and Andes Copper Mining Co. Mr. Brinckerhoff had been executive vice president of the two latter named subsidiaries. **C. J. Parkinson,** general counsel, has been elected a vice president of Anaconda. **Norbert F. Koepel,** formerly assistant to vice president of Chile Exploration and Andes Copper, is now a vice president. **Richard S. Newlin,** Anaconda's vice president in charge of operations, was elected a director of Greene Cananea Copper Co., Chile Copper, Chile Exploration, and Andes Copper.

Parkinson

D. F. Rice has been made supervisor of metal products fabrication for Consolidated Mining & Smelting Co., Trail, B.C. He was formerly supervisor of research administration.

Clarence E. Shea, safety supervisor in Oliver's Hibbing-Chisholm district, has retired after 42 years' service.

Enrique Madero Sr., of Central de Minera, and **Jose Garcia,** of Vaupell & Garcia, have been named to represent private industry on the board of Comision de Fomento Minera, a Mexican government agency designed to aid small mines.

Daniel Langfeldt, mining engineer, has recently assumed duties with the Health and Safety Activity of the Bureau of Mines, Duluth, Minn. He was formerly with Anaconda Co., United States

William F. Spain has been appointed general manager and director of Wah Chang (Australia) Pty. Ltd.

Smelting & Refining Co., Lark, Utah and with Homestake Mining Co., Lead, S. D.

Stuart V. Bradley has been appointed to the newly created post of staff assistant to director of mineral development, and **A. Herbert Axelson** has been named manager-mining engineering for U. S. Steel's Oliver Iron Mining division.

Royal J. Gidney was appointed as director of the construction and supply division of the Grand Junction Operations Office of the AEC, succeeding the late Conrad G. A. Peters.

John J. Skipper, Greenfield, Calif., was elected president of newly formed Bakersfield chapter of the Western Mining Council. **Alfred Siemon,** Bakersfield attorney, is vice president; **W. J. Redus,** secretary; and **Mrs. V. R. Stonebreaker,** treasurer and publicity chairman.

The **Hon. Onesime Gagnon,** lieutenant-governor of the Province of Quebec, and **Norman E. Phipps,** a partner in a Toronto law firm, have been elected directors of La Compagnie Miniere de l'Ungava Limitee. Mr. Gagnon served as Minister of Finance for P.Q., before his resignation from the Cabinet; Mr. Phipps has been identified with mining activities.

James M. Macintyre has been appointed to the post of master mechanic in the milling department of Climax Molybdenum Co. Before joining Climax, Macintyre, who is a native of Scotland, was employed as mechanical superintendent at Britannia Mining & Smelting Co., at Britannia Beach, B.C. His engineering experience, extensive and varied in the mechanical aspects of placer and hard rock mining, has taken him to Malaya, Nigeria, England and Canada. A graduate of the Royal Technological College in Glasgow, Scotland, in 1923, Macintyre's professional affiliations include AMIMechE (GB) and he is a registered professional engineer of British Columbia.

Macintyre

W. Lunsford Long of Warrenton, N. C., board chairman of Haile Mines, Inc., has relinquished all of his official positions with Haile Mines and its subsidiaries, as well as the presidency of the Tungsten Institute, which he founded, and has retired as of April 1.

Brower Dellinger, manager of the Monticello, Utah mill operated by National Lead Co. for the AEC, has been named plant manager for NL's Tahawus, N.Y. titanium facility.

F. A. Linforth, retired assistant to vice president of the Anaconda Co., Butte, was honored by the Montana Society of Engineers at its 70th annual meeting.

Jean Raymond, Q.C., was elected to the board of directors of Noranda Mines Ltd. He replaces his father, the **Hon. Alphonse Raymond,** a member of the Noranda board since 1938, who resigned due to ill health. At the same annual meeting, **R. V. Porritt,** general manager since 1951 and with Noranda since 1926, was also elected to the board. He was later appointed a vice president and will continue as general manager.

Thomas O. Breitling of Denver was elected president of Canyon Gold, Inc., Mar. 26.

Walter Maybank, for many years chief engineer of MacLeod-Cockshutt Gold Mines Ltd., has been appointed head office liaison engineer of Little Long Lac Gold Mines Ltd. In 1937, he served as safety engineer and chief engineer of Little Long Lac, and in 1948 came to Toronto to take charge of exploration for that company.

W. A. Roliff is now president of the Geological Association of Canada.

J. B. Mudd, formerly assistant consulting engineer for the Free State, has been appointed consulting engineer for the West Rand. **A. I. Beck** has been appointed acting assistant consulting engineer to replace Mudd. **R. H. Bryson,** who was manager of Loraine gold mine, replaces Beck. Anglo-American Corp. of South Africa Ltd. also has appointed **H. E. Brown,** manager of Western Holdings, to manager of Western Reefs, and **J. G. Hamilton,** assistant manager at Western Holdings, has been made manager of that mine. **A. Tennant** has become acting manager of Loraine mine.

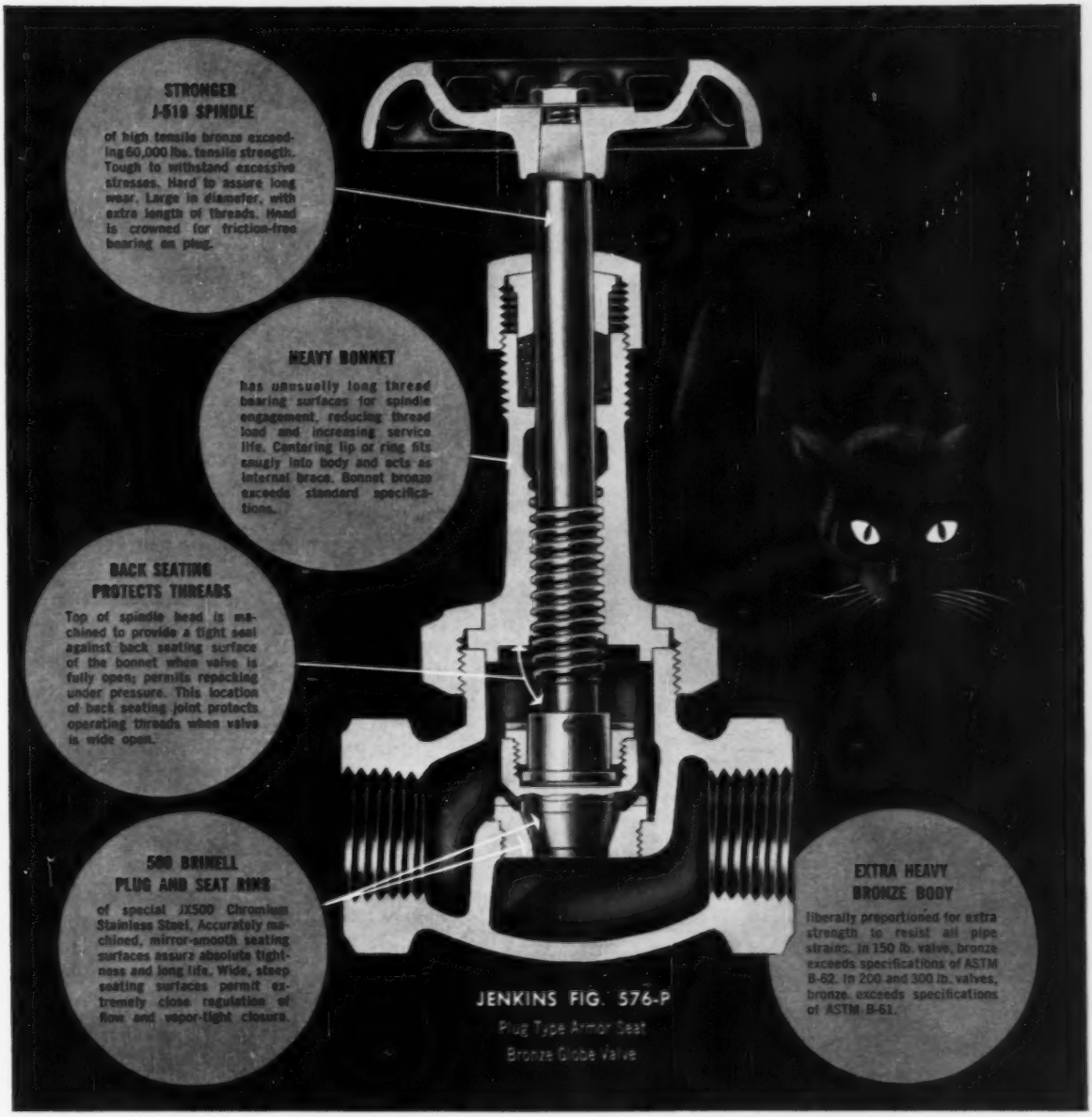
William J. Bennett resigned as president of Eldorado Mining & Refining and Atomic Energy of Canada Ltd., as of April 30, and has accepted the post of executive vice president and general manager of Canadian British Aluminum Co.

R. Massey Williams, mining engineer and geologist, has returned to private practice as consultant at 100 Adelaide St. W, Toronto.

G. B. O'Malley, of Cyanamid Australia Pty., Ltd., Melbourne, was awarded the Institute Medal of the Australasian Institute of Mining and Metallurgy at a recent annual conference in Tasmania. Mr. O'Malley, a director and head of the technical services division of the Australian affiliate of American Cyanamid Co., started as a field engineer in the mining chemicals division 19 years ago. Prior to joining Cyanamid, he was on the staff of the University of Melbourne for 11 years as senior lecturer, mining and metallurgy. During World War II, he served with the Australian Council for Scientific and Industrial Research.

O'Malley

Where valves need 9 lives...


STRONGER J-510 SPINDLE
of high tensile bronze exceeding 60,000 lbs. tensile strength. Tough to withstand excessive stresses. Hard to assure long wear. Large in diameter, with extra length of threads. Head is crowned for friction-free bearing on plug.
HEAVY BONNET
has unusually long thread bearing surfaces for spindle engagement, reducing thread load and increasing service life. Centering lip or ring fits snugly into body and acts as internal brace. Bonnet bronze exceeds standard specifications.
BACK SEATING PROTECTS THREADS
Top of spindle head is machined to provide a tight seal against back seating surface of the bonnet when valve is fully open; permits repacking under pressure. This location of back seating joint protects operating threads when valve is wide open.
500 BRINELL PLUG AND SEAT RING
of special JX500 Chromium Stainless Steel. Accurately machined, mirror-smooth seating surfaces assure absolute tightness and long life. Wide, steep seating surfaces permit extremely close regulation of flow and vapor-tight closure.
EXTRA HEAVY BRONZE BODY
liberally proportioned for extra strength to resist all pipe strains. In 150 lb. valve, bronze exceeds specifications of ASTM B-62. In 200 and 300 lb. valves, bronze exceeds specifications of ASTM B-61.
JENKINS FIG. 576-P
Plug Type Armor Seat
Bronze Globe Valve

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Or where abrasion, entrapped pipe chips, scale or rust tubercles are a problem . . .

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PERSONALS *(Continued)*

Frank R. Milliken has been appointed executive vice president of Kennecott Copper Corp. He has served as vice president in charge of mining operations since joining Kennecott in 1952. A graduate of M.I.T., Mr. Milliken remained an additional year at the Institute as an assistant in the department of mining. He began his professional career as a research metallurgist at a zinc concentrating plant in New Mexico, progressing through various technical and operating positions in the mining industry, including that of experimental engineer with Kennecott's Utah Copper Division. In 1952 he received AIME's Richards Award.

Milliken

Calvin A. King has been elected first vice president of Bird Machine Co., South Walpole, Mass., and **Henry H. Shepherd** vice president in charge of sales. King, recently assistant to the president, was formerly manager of the Bird Research and Development Center.

K. C. Gray was elected a director of Kerr-Addison Gold Mines Ltd. at an annual meeting Apr. 22. **James Y. Murdoch** resigned as president to become first chairman of the board. **William S. Row,** formerly manager and for the past two years executive vice president, was elected president. **H. L. Roscoe,** vice president of Noranda Mines and a director of Kerr-Addison since 1954, was elected vice president.

R. D. Perry, vice president and general manager, and **Robert Hendricks,** vice president-sales, have been elected directors of Consolidated Mining & Smelting Co. of Canada Ltd.

John E. Weber retired on May 1 as mine captain of St. Joseph Lead Co.'s Doe Run mine.

Henry K. Martin has been appointed to the newly created post of director of mineral development, Oglebay Norton Co. Formerly superintendent of concentration at Phelps Dodge Corp.'s Copper Queen branch in Arizona, Martin was previously connected with Oglebay as development engineer at Reserve Mining Co.

H. R. Cooke Jr., geologist and engineer of Reno, Nev., is now with Arnold H. Miller Inc., consulting engineer, of New York, in Costa Rica and Cuba.

Theodore Marvin, president and chairman of the board of Michigan Chemical Corp., was re-elected at the company's annual organization meeting, as were all board members, at a stockholders meeting.

Donald J. McParland has been named chief engineer and head of the central engineering department of Rio Tinto Mining Co. of Canada Ltd.

Samuel N. O'Neal, shift foreman in the Leadwood mill of St. Joseph Lead Co., has retired after over 40 years' service.

D. F. Coolbaugh in his new position as advisor in mining technology for the Ford Foundation has the following address: D. F. Coolbaugh, Mining Advisor, Government Technical Institute, Insein, Burma.

Gordon Soine and **George Magnuson** have joined the mining engineering staff of the Montreal (Wis.) mine of Oglebay, Norton & Co., the latter as operating engineer. **Lawrence Urli** was promoted to mining captain; **Robert H. Holgers** has been made assistant superintendent of the mine.

John Douglas MacKenzie was elected president of American Smelting & Refining Co., April 22. His career with Asarco began in 1920 at the Garfield smelter, successively as chemist, metallurgist and assistant general superintendent. After several months with Northern Peru Mining & Smelting Co. as consultant, he returned to Utah as assistant manager of Utah department; in 1928 he was made manager of East Helena (Mont.) smelter. In 1939 MacKenzie went to El Paso (Tex.) smelter as manager of Southwestern department; from there to San Francisco as general manager of Selby (Calif.) smelter and vice president of Federated Metals division. He was made general manager of Western Smelting department in 1946; in 1948 vice president in charge of smelting and refining operations; in 1949 Asarco director. He is also director of General Cable Corp., Revere Copper & Brass, Inc. and of Western Phosphates and Southern Peru Copper Corp.

MacKenzie

Donald W. Johnson has been named manager of Reynolds Metals Co.'s aluminum reduction plant at Longview, Wash. He succeeds **V. G. Kneeskern,** who has been named manager of Reynolds St. Lawrence reduction plant at Massena, N.Y. Mr. Johnson, a graduate of the University of Washington, joined Reynolds in 1946 as assistant carbon plant superintendent at Troutdale, Ore. In 1950 he headed the carbon operations; and since 1954 he was assistant plant manager until his transfer to Longview last August.

Johnson

Pyle

Byron Pyle has been elected president of Kennedy Van Saun Manufacturing & Engineering Corp. of New York City and Danville, Pa. He fills the vacancy left by the late Fred O. Reedy. Mr. Pyle has served as assistant to president, vice president and executive vice president during his 13-year association with the company.

OBITUARIES

Clinton Caroll Anderson, 52, mine foreman for Superior Mines, Bonanza, Colo., and one time superintendent of maintenance for Bagdad Copper Corp., died Mar. 1.

A. E. Cranstoun, 69, accountant for Brewis & White Ltd., Toronto, and formerly with Hard Rock Gold Mines at Geraldton, died suddenly of a heart attack in early April.

Edwin B. Vogt, 73, retired St. Joseph Lead Co. employee, died in Bonne Terre (Mo.) Hospital, Apr. 14.

Edward Thornton, 79, died Apr. 20 at Los Angeles, Calif. For many years engineer and manager of properties in Mexico and later manager of mines in Arizona, Colorado and Oregon, he was in recent years consultant on mining properties in Mexico and the U. S. From 1921-'31 he was vice president of Southwestern Engineering Co. and at one time president of the Colorado Mining Association. Until recently he was a member of AIME.

Paul H. Hunt, 75, leader in the western lead-silver-zinc industry for over 40 years, died Apr. 17 of a heart attack, in Fresno, Calif. He retired as a director and a consultant for United Park City Mines Co. in May 1955, and continued work in research and development for Anaconda Co. at Salt Lake City. Mr. Hunt served both the Utah House and Senate during his career.

John B. Platts, 76, veteran Coeur d'Alene district mining geologist, died Mar. 10 of a heart attack.

William J. Stratton, 91, retired mining man and founder of the Silver Dollar Mining Co. and other Coeur d'Alene companies, died in Spokane, Mar. 24.

James Buchanan, 79, former general manager of Consolidated Mining & Smelting Co., died at Trail (B. C.) Hospital, Apr. 1. He had retired in 1944 as manager of the Tadanac plants.

Lester E. Wilensky, 37, developmental engineer in the Dow Chemical Co.'s magnesium technical service and developmental group, died Apr. 6 in a plane accident near Freeland, Mich.

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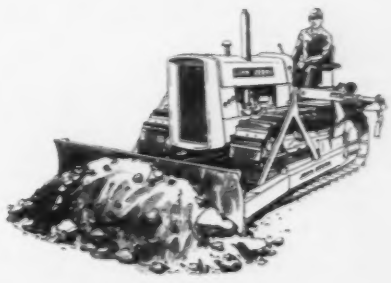
There's a John Deere Industrial Unit to suit your needs exactly, including Diesel-Scraper combinations (above), and Wheel and Crawler-Loader, Dozer, Shovel and other combinations (below).



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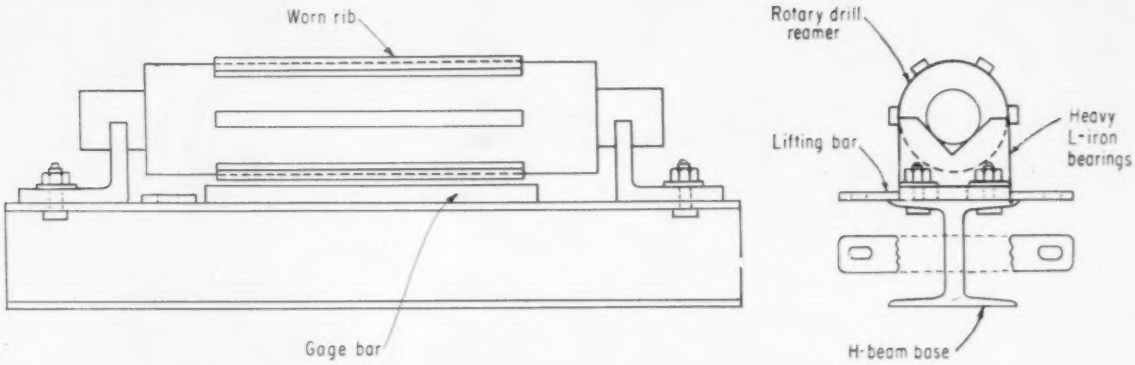
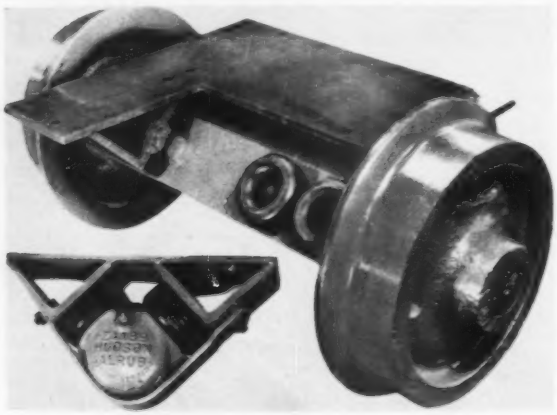
OPERATING IDEAS



Jig Simplifies Repair of Rotary Drill Reamer Units

A SIMPLE JIG has speeded repairs of worn reamer units on the B-E 40-R rotary drills operating in the open pit at Miami Copper Co.'s Copper Cities Division, Miami, Arizona.

Principal repair job involves welding up the worn ribs positioned at six points around the circumference of the reamer body. Before adopting the jig (devised by Lynn Atwood, drilling and blasting foreman) much time was spent in positioning the reamer body at desired points before welding and in checking the height of build-up on ribs during welding operations. Now, with the improved set-up, the welder, working between the jig's angle iron bearings, can quickly and effortlessly turn the reamer body to any desired position. The gage bar installed along center line of the upper face of the H-beam base gives him a constant check on the height of build-up on each rib every time he turns the reamer body.



Rubber Suspension Lengthens Mine Car Service Life

A NEW RUBBER SUSPENSION, adding years to mine car life by off-setting coil spring breakage caused by corrosion and metal-to-metal wear, has been announced by the Natural Rubber Bureau, Washington, D.C.

In the form of natural rubber rings which completely detach the axle box from the rest of the chassis except on a rebound, this new type spring provides resilience fore, aft and laterally, as well as vertically.

Loads up to 7,500 lb can be handled by each ring pair, and, for heavier loads, rings mounted abreast on suitable bearings can be used.

Information can be obtained from the Natural Rubber Bureau, 1631 K Street, N.W., Washington 6, D.C.

Improved Chemical Sprays Safely Reduce Roadside Plant Growth

GREATLY IMPROVED roadside vegetation clearance is now being obtained by using a series of recently perfected chemical sprays, according to Jay Shideler, Indiana highway official, in an address at last year's National Highway Conference, French Lick, Indiana.

Uncontrolled vegetation obscure sway-side warning signs, cuts off view at curves and intersections, and reduces passing-parking areas. Weeds, grass and brush, said Shideler, may also damage road shoulders or interfere with drainage, causing dangerous patches of ice. In hot, arid areas, though some of these problems don't exist, the prime hazard is that of fire, and roadside growth is usually checked as far as eight feet from the pavement.

In most cases, he continued, chemical sprays have been able to permanently reduce growth problems and have done so more cheaply and quickly than any other method (burning, mowing, etc.).

"While several classes of soil sterilant compounds have been available for a long time," Shideler said, "some have serious disadvantages. Chlorate compounds are flammable while toxicity to people and animals presents a problem in using any arsenical material. The high volume of any borax material required to obtain soil sterility makes it difficult to use such materials over long distances of highway right-of-way. However, with one of the substituted ureas, such as "Telvar" W monuron weed killer, one pound will cover an area of about 1,000 sq ft."

Mr. Shideler said that "this material is generally used at about 40 lbs per acre, and one application provides control of most weed species for an entire season or longer. It is a wettable powder which mixes readily with water, but it doesn't dissolve. It's also non-volatile, non-corrosive, non-flammable and low in toxic hazard to people and animals under conditions recommended for use. Another "Telvar" advantage is that you can use it before growth starts in the spring, and not worry about weeds for the rest of the growing season. In storage areas and equipment yards, it's much easier to spray the whole area once than keep going back all summer long to mow it. In drainage ditches, we have found that one application of "Telvar" weed killer kept the ditch free of vegetation for the entire season. Even where you want sod in the bottom of the ditch, you can save a good deal of mowing and hand-clipping around culvert openings and catch-basins by careful use of a soil sterilant weed killer."

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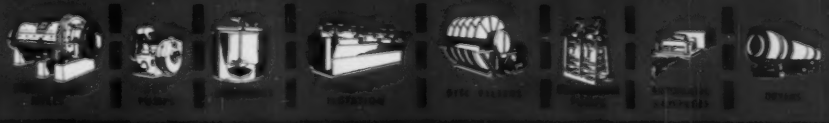
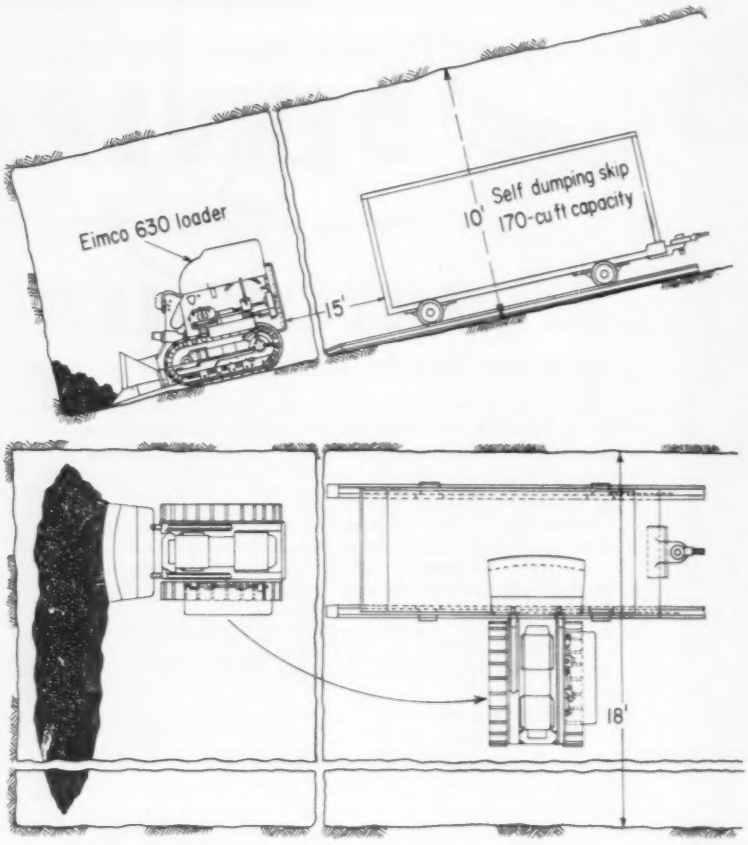


OPERATING IDEAS *(Continued)*

Shaft Sinking Operations Accelerated by Crawler-Mounted Loader



A CRAWLER-MOUNTED LOADER has made it possible to complete a "round out and in" during each eight-hour shift at Pend Oreille Mines & Metals Co.'s lead-zinc property, Metaline Falls, Wash. Previously, only one round per day (mucking one shift and mining the other) was possible with a slusher ramp setup in the main 12-deg incline now being deepened to extend the existing haulage conveyor system.

The present scheme involves using an Eimco 630 crawler-mounted loader and an offset 48 in. gage track laid temporarily on the floor of the large incline to provide sufficient room for side skip loading. Temporary track in the 10x18 ft incline is laid 300 ft on steel ties, with operation stopped when this point is reached to set timber and install the permanent track. A 350-hp sinking hoist (5,000 ft capacity with one-inch rope) is used to actuate the 170 cubic ft skip operating on the temporary track. Each loaded skip is hoisted to a storage pocket and automatically dumped. Material stored in the pocket is subsequently transported to the surface via the main haulage conveyor system serving the mine's upper horizons.

All drilling in the incline is done with a mechanical jumbo equipped with hydraulic jibs. Rounds broken average 7½ ft and monthly advance exceeds 300 ft. Water encountered in the face is handled with air pumps to a maximum head of 100 ft and discharged into sumps equipped with electric-driven pumps capable of pumping water to the sinking hoist level. A diamond drill hole always detects large bodies of water.

Dissimilar Non-ferrous Metals Can Now Be Chemically Joined

JOINING NONFERROUS METALS through a permanent chemical bond by using InterAct, is a revolutionary advance, according to Intertectics, Inc., Bedford, Ohio.

Joints made with the new material, Intertectics report, represent a totally new concept in the union of metals which cannot be classified as soldering, welding or brazing operations. The resulting joint is usually stronger than either of the metals involved, greater in corrosion resistance, and similar in electrical, physical and chemical properties.

The company claims that InterAct makes commercially feasible the chemical joining of copper and aluminum, and that it can also join magnesium, titanium, brass, zinc, silver and gold.

Chemically, InterAct is a material which, under the influence of heat, eliminates the surface oxide layer and causes similar and dissimilar metals to flow together at temperatures lower than the melting point of either metal being used. (It's therefore a reaction eutectic).

The material is now available in three forms. InterAct-S, a ⅛-in. wire, is composed of zinc, lithium, potassium and sodium chlorides encased in an extremely pure alloy of zinc and aluminum. This is recommended for exposed-type junctions.

InterAct-E, a powder, is similar to InterAct-S but is designed to join broader areas of contact. A granular variety, Inter-Act-G, contains aluminum, zinc and sodium chlorides, and works well when large surfaces are to be brought together at temperatures lower than those available with InterAct-E. Shelf life of these bonding agents is indefinite. However, powder forms must be used shortly after a bag has been broken—hygroscopic action will destroy them.

Use is simple: joint is heated by torch or oven and wire is fed into the joint. It takes approximately two seconds to complete the reaction, once proper temperature (about 810°F) has been reached. It is then flushed with warm water to remove reaction by-products. Operator must be protected—the materials are toxic to skin and lungs.

Product's basic research was done by Horizons, Inc., Cleveland process and materials research organization. Intertectics, formed in 1953, began financing this research in 1954 and, in January 1957, began pilot plant development.

Manufacturing process required equally diligent research. One major problem was how to package an intensely hygroscopic, corrosive material. The answer came in a unique method of making the sheath—it's formed as the InterAct is injected under vacuum.

In a conveyor operation, the materials to be joined are moved on a conveyor through an induction furnace or gas oven, heated to approximately 810°F. InterAct, formed in ⅛-in. diameters to fit standard industrial welding guns, is fed to the point, which is then cleaned with a water spray. A suction pump equipped hooded exhaust system vents the fumes away from the working area.

Intertectics officials point out that the process can be adapted to the do-it-yourself home market, if the following precautions are strictly observed: (a) joined pieces must be the same metal in the some analysis, (b) joint members must have the same physical dimensions, and (c) all parts to be joined must reach reaction temperature at the same time.

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Profit comes fast with Limas—a complete line of rugged machines from ½ to 6 cu. yds. As hundreds of operators have found, these quality-built machines mean faster digging cycles, easier handling, less downtime and greater production.

Here are some of the quality features that keep production high and downtime low on Limas:

Crawlers are wide and long for solid ground contact and ease of handling in close quarters.

Tread rollers have specially hardened rims to resist wear . . . have dirt seal rings and retainers.

Drums are extra-wide with large diameters . . . a big advantage when operating as a dragline, crane or high lift shovel because of the greater cable capacity.

Anti-friction bearings at all important bearing points including the drums.

Extra-large air operated clutches respond instantly to the slightest movement of the controls—lessening operator fatigue.

Torque converter gives greater output, reduces shock loading, prevents engine stall . . . cushioned effect of drive lengthens cable life, reduces machinery maintenance. Standard equipment on Type 2400.

All gears, smaller parts and shafts that are subjected to extra wear are flame or induction-hardened for longer life.

Find out more about built-for-profit Limas from your nearby distributor or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

Lima Type 802 Shovel excavating overburden for iron ore mining near Virginia, Minnesota.

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Are You Preparing *Now* For The Next Boom?

America's leading companies are not sitting on their hands waiting for the recession to end. They are planning ahead ***now*** for higher sales and near-capacity rates of operation.

These facts stand out clearly from the eleventh annual survey of Business' Plans for New Plants and Equipment just completed by the McGraw-Hill Department of Economics:

- **Manufacturing companies expect their sales to increase 20%, on the average, from 1958 to 1961.** Growth industries, such as chemicals and electrical machinery, expect gains of 25% to 34%.
- **If these sales gains are achieved, the average rate of operations in manufacturing will rise from 78% at the end of 1957 to almost 85% by 1961.** This is the point at which pressure on costs begins to mount, as less efficient facilities are pressed into service.
- **Industry is not waiting for this point to begin getting its plants and equipment in shape for the next boom.** Despite record expansion in the past several years, many manufacturing companies plan to add new capacity in each of the next four years. But, more important, they are going ahead with the vital job of modernization and cost-cutting.

In the years immediately ahead almost two-thirds of capital investment will go for modernization and replacement of present plants and equipment. In this way manufacturing companies can avoid the higher costs and the squeeze on profits that occur when producing facilities are not in shape to handle an increase in sales volume.

These are the plans, as reported to McGraw-Hill, of a wide sample of manufacturing companies—for the most part, large firms and leaders in their respective industries. Altogether, these firms account for almost 40% of all employment in manufacturing industries.

Now Is The Time

How do your plans measure up? Are you planning ahead now for a 20% sales increase in the next three years? Is your company planning to modernize its buildings and equipment more rapidly than at any time in the recent past? If not, here are some of the inducements

that McGraw-Hill editors report from their continuous checking on the state of business.

(1) **There are plenty of opportunities for increasing efficiency by the installation of new equipment and the improvement of layouts in plants, warehouses and offices.** Despite the installation of tremendous volumes of metalworking equipment in recent years, according to AMERICAN MACHINIST over half of the machine tools now in U. S. factories are over 10 years old. Replacement of worn-out and obsolete equipment will mean material savings in operating and maintenance costs.

(2) **Machinery, parts, materials and labor are much more readily available now than they are when the economy is running at full steam.** You can be more particular about quality and about specification to meet your own requirements.

(3) **With lower interest rates and less competition for loans, it is both easier and cheaper to borrow money to finance equipment and construction.** To wait for another boom is to run the risk of having to pay higher interest rates and look harder for money.

(4) **Although there is an adequate supply of most types of labor available now, the prospect is that the supply of factory labor over the years ahead will be tight.** In 1965, there will actually be fewer men and women between the ages of 25 and 44 than there are now. Good factory workers will be either hard to get, or wage rates will rise sharply or—more likely—both. The best answer is to anticipate the rise in labor costs by installing more efficient equipment to increase labor productivity.

(5) **Finally, the costs of investing in new buildings and improved equipment *now* are almost surely less than they will be later.**

These are some of the reasons why many leading firms find ***now*** the best time in years to start on a program of plant modernization. There are other good reasons in the many new products and processes coming from the boom in research and development. This year industry will spend over $8 billion on R & D—$1 billion more than in 1957. And a heavy share of the new product development will consist of better machines and processes to be made available during the next few years. Already the pace of technical advance is so rapid as to call for modernization of plants built only a few years ago.

Years of Opportunity

It has been said that the years between now and 1961 are the "middle years" between two booms. This does not mean a long period of recession, but a period of slower growth—a transition from the postwar boom based on deferred demand, to a new boom in the 1960s based on dynamic population growth and a revolution in technology.

If so, these are the years of opportunity for business—opportunity to prepare for the growth that lies ahead with the most efficient equipment, the most modern plant and the best production organization that can be devised. This is the way to fight higher costs and avert a resumption of inflation. This is also the way to ensure that your company will be ready for its new markets in the 1960s.

Are you planning ahead ***now*** to be among the leaders?

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT

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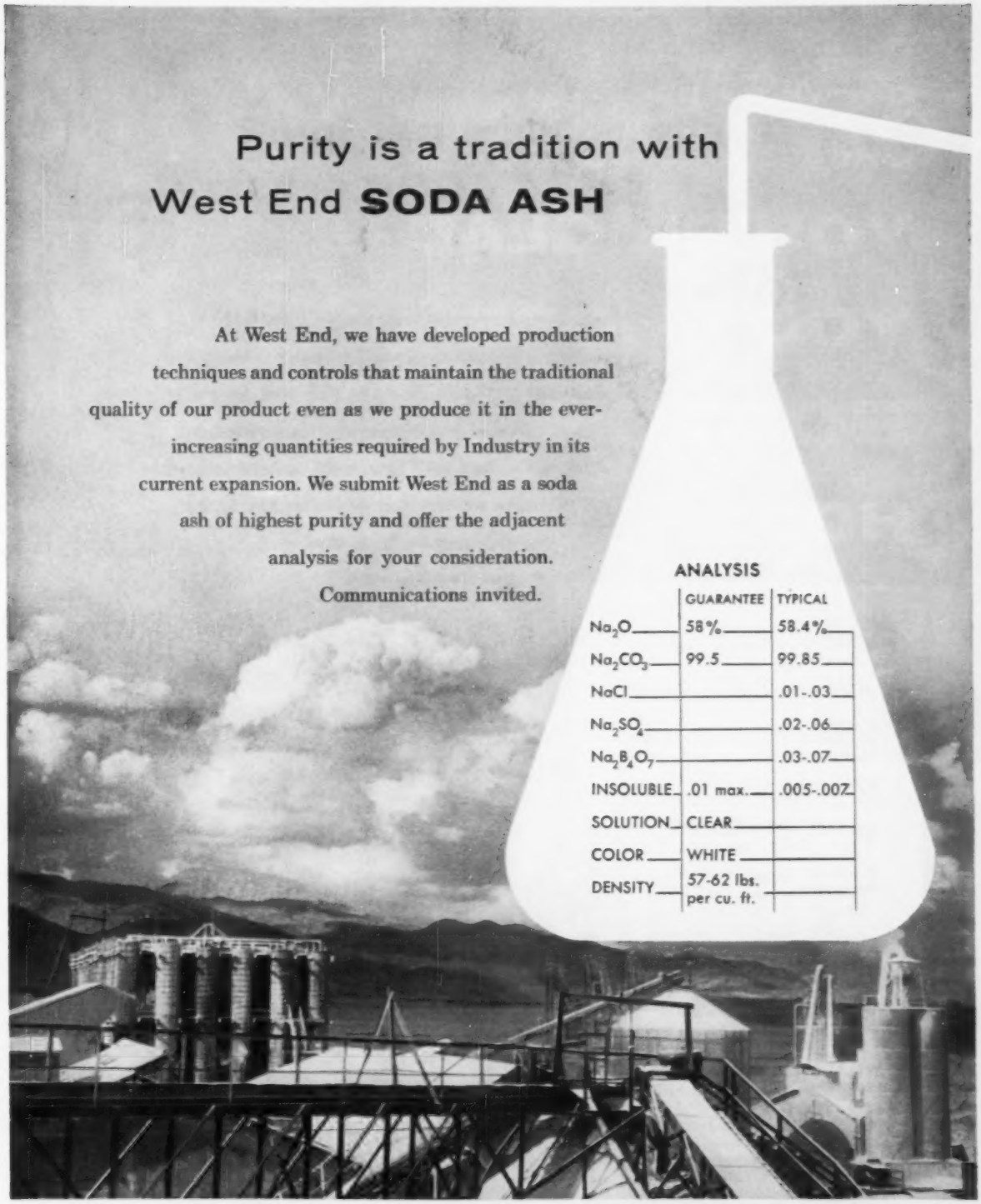

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ANALYSIS

	GUARANTEE	TYPICAL
Na_2O	58%	58.4%
Na_2CO_3	99.5	99.85
NaCl		.01-.03
Na_2SO_4		.02-.06
$Na_2B_4O_7$		.03-.07
INSOLUBLE	.01 max.	.005-.007
SOLUTION	CLEAR	
COLOR	WHITE	
DENSITY	57-62 lbs. per cu. ft.	

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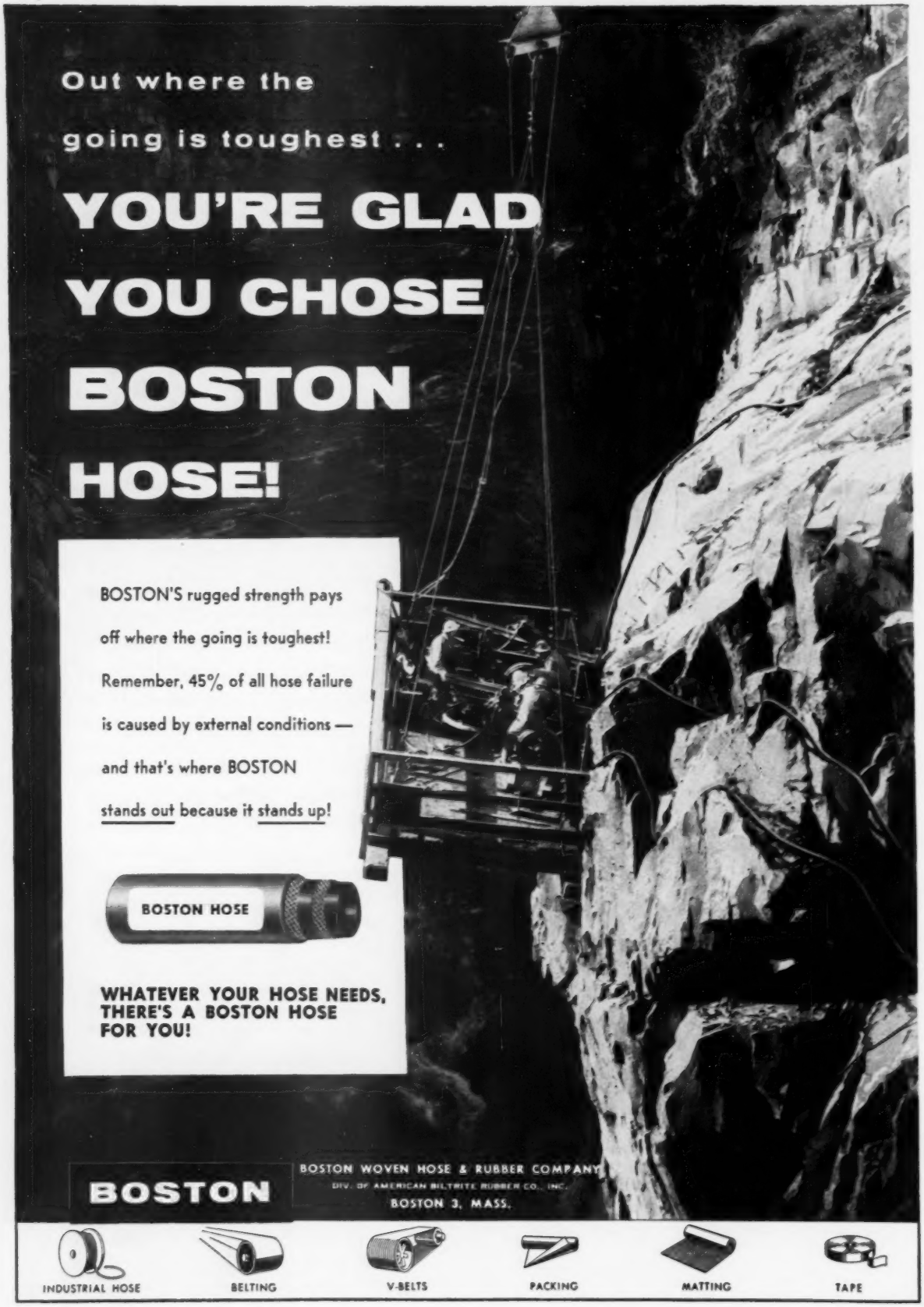
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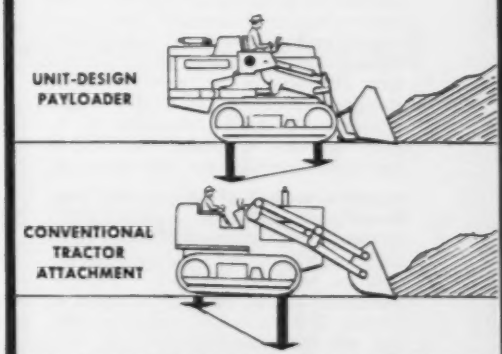

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WHAT'S NEW IN U.S. PATENTS

OLIVER S. NORTH

Exploration

Improved wire line core barrel having a simplified and strengthened latching mechanism so as to prevent core sample from pushing barrel upwardly through the drill stem. Core barrel can be readily released from the drill when it is desired to pull a core. A. F. Pickard and W. W. Svendsen, assigned to E. J. Longyear Co. No. 2,829,868.

Metal and Mineral Processing

Process for selectively establishing and maintaining specific temperature areas in a rotary furnace used for reducing hematite, magnetite, taconite, ilmenite and the like. Oxygen is introduced at various points along the kiln. Method prevents formation of clinker rings in the kiln. O. Moklebust, assigned to National Lead Co. No. 2,829,042.

In a process for treating low-grade iron ores, the ore is crushed and separated into high-grade, middling and tailing fractions. Middling is showered through a melting furnace and the molten dust separated from the furnace gas. Unreduced middling is passed through a heated column of carbon, and resultant molten iron separated from slag. W. E. Greenawalt. No. 2,829,043.

Process for removal of zinc from zinc-iron oxide ores, such as franklinite, or ores which can be readily transformed into the oxide state, such as sphalerite-pyrite or iron-containing smithsonite ores. Reduction is effected with iron oxide instead of the usual metallic iron. Zinc is recovered from vapor. H. Clasen, assigned Metallgesellschaft. No. 2,829,-044.

Treatment of gold or silver ores, particularly carbonaceous or very refractory ores, to render them more amenable to cyanidation procedures. Ground ore is formed into an aqueous pulp, which is then extracted in the presence of an effective amount of an alpha-hydroxy nitrile, for example, lactonitrile. E. L. Carpenter and N. Hedley, assigned to American Cyanamid Co. No. 2,829,045.

Improved method of refining lead from bismuth-lead mixtures. Lead-containing sodium or potassium is added. After debismuthization, the sodium or potassium is removed from the lead by electrolysis. D. R. Blaskett, assigned to Broken Hill Associated Smelters Pty., Ltd. No. 2,829,093.

Process for flotation concentration of siliceous oxidized copper ores, for example, a Chilean ore consisting of chrysocolla, quartz and minor amounts of other gangue materials. Before flotation, the following reagents are added to the aqueous ore pulp: a water-soluble inorganic sulphide, copper sulphate, and a water-soluble salt of 2-mercaptobenzothiazole. N. Arbiter. No. 2,829,770.

Mr. North is patent consultant, Washington, D. C.

Improved thermal process for producing aluminum by reduction of alumina with carbon or aluminum carbide. M. A. Miller, L. M. Foster and C. D. Baker, assigned to Aluminum Co. of America. No. 2,829,961.

Method of producing high-purity tungsten sponge or powder by decomposition and simultaneous reduction of scheelite ore. Crushed ore is mixed with boric acid and reacted in a reducing atmosphere at a temperature of approximately 1200 deg. Calcium compounds are leached from the residue with a mineral acid. L. D. Supiro. No. 2,829,962.

Method for recovering nickel from lateritic iron ores or the like. Ore is roasted and mixed with an aqueous ammoniacal solution of an acid in an amount sufficient to dampen, but insufficient to cake, the ore. Material is then contacted with an ammonia-oxygen gas and leached with an ammoniacal ammonium salt solution to remove nickel. A. N. Hixson and C. B. Bare, assigned to Bethlehem Steel Co. No. 2,829,963.

COPIES of U. S. patents can be purchased at 25c each from Commissioner of Patents, Washington 25, D. C.

Inner-electrolysis process for eliminating nickel from mixed solutions of cobalt and nickel. H. Castagna, G. Gravey, F. Reynaud and A. Roth, assigned to Societe d'Electro-Chimie d'Electro- Metallurgique et des Acieries Electriques d'Ugine. No. 2,829,965.

Process for treating arseniureted ores, particularly those of cobalt and/or nickel, such as smaltite, with chlorine gas to dissolve most of the arsenic and metals. Pre-roasted ore is added to the suspension and the temperature raised to 80 to 100 deg C to form hydrochloric acid. H. Castagna, G. Gravey and A. Roth, assigned to Societe d'Electro-Chimie d'Electro-Metallurgique et des Acieries Electriques d'Ugine. No. 2,829,-966.

Simple and efficient leaching process for recovering values from complex ores having oxide or carbonate constituents. Ore is treated in an arrangement of successive closed zones, all of which are maintained under moderate pressure. J. C. Grant and P. B. Sweet. No. 2,830,895.

Improved rotary drum for forming pellets of mineral materials, especially ore concentrates. Pellets produced in this mechanism have sharply reduced tendency to spall during subsequent handling and induration. F. D. De Vaney, assigned to Erie Mining. No. 2,831,210.

Economical process for froth flotation of low-grade magnesite to produce a refractory-grade material containing less than 5% silica. A. J. Weinig, and J. F. McIntosh, assigned to Basic Inc. No. 2,831,574.

Centrifugal classifier capable of accomplishing sharp separation of component fractions of a ground ore. A. A. Maino, assigned to Raibi Societa Miniraria del Predil S.p.A. No. 2,831,575.

Method for treating low-grade oxidic or lateritic ores of nickel. Ore is crushed and mixed with a mineral acid, and the mixture heated to 90 to 300 deg C for at least one hour. Resultant hard mass is pulverized and subjected to multiple leachings with reagents of progressively higher pH. M. J. A. Birner, assigned to Joseph J. Schedel. No. 2,831,751.

Fluidized bed apparatus and method for producing iron in the form of sponge from iron oxides such as magnetic ores or calcined pyrites. Particles are prevented from fusing together, which causes settling. W. H. Osborn, assigned to Phelps Dodge Corp. No. 2,831,759.

Method for recovering metal values from dilute aqueous solutions obtained by leaching low-grade ores with acids. Dissolved value is deposited on an ion exchange body. Eluant used for recovery of the deposited metal is a by-product acid from the autoclave reduction process. S. Nashner and J. Dasher, assigned to Chemical Construction. No. 2,831,763.

These Patents—17 Years Old—Have Now Expired

Patents of June 1941

Processes for continuous chlorination of ilmenite or other ores or residues consisting essentially of titanium and iron. Chlorination is conducted at a temperature sufficiently high to volatiiize iron chloride and titanium tetrachloride. Chlorides are selectively condensed from the resultant vapor. I. S. Muskat and R. H. Taylor, assigned to Pittsburgh Plate Glass Co. No. 2,245,076 and 7.

Apparatus and method for rendering more amenable to electrostatic concentration such nonmetallic minerals as fluorspar, feldspar, pyrophyllite, olivine, talc, kyanite and zircon. Ore is treated with a fluid reagent which conditions surfaces or mineral particles to make them either conductive or non-conductive. Among the metallics that may be thus treated are siliceous manganese and phosphates. F. R. Johnson. No. 2,245,200.

Method for the chlorination of ilmenite or the like. Plugging of the chloride condensing system is avoided by washing the gaseous mixture with liquid titanium tetrachloride to remove substantially all of the iron chloride. A. Pechukas, assigned to Pittsburgh Plate Glass Co. No. 2,245,358.

B.F.Goodrich

B.F.Goodrich tires give strip miner 20% more mileage than other makes!

FAUZIO BROS. strips coal in the area around Nesquehoning, Pa. 72 trucks haul loads as heavy as 32 tons up steep, winding mountain roads. Tire failures were common in this grueling work. Then the company switched to B.F.Goodrich tires—today uses 480 of them! Why? Because B.F.Goodrich tires give 20% more service than any other make, reduce road delays, can be retreaded 2 to 3 times!

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KIRKVINE WORKS of Alumina Jamaica, Ltd. (Aluminium Ltd.), has been increased to nearly 500,000 tons per year. New plant at Ewarton will produce 220,000 tons.

Jamaican Bauxite Continues Expansion

WITH THE FORMATION of the new West Indian Federation, Jamaica's growth as a major bauxite and alumina producer is continuing. Scale of mining operations is expected to reach 6-million tons by 1959. Ore reserves have been estimated at 500- to 600-million tons.

Alumina expansion has been increased to nearly 500,000 tons per year at the Kirkvine Works of Alumina Jamaica, one of the three bauxite companies on the island. Both Reynolds Metals and Kaiser Aluminum are also major factors in bauxite production, and ship to the U.S. Alumina Jamaica, which is also constructing a 220,000 ton per year plant at Ewarton, ships to the Kitimate smelter in British Columbia.

New Legislation Boosts Brazilian Mining

THE BRAZILIAN GOVERNMENT, after looking around for new dollar earners in export items, has turned to its minerals. For some time mining operators have been reluctant to go into the export business because of the large capital investment needed and because the Brazilian government gave such small payments in cruzeiros to the exporter for every dollar earned.

The country operates on a multiple exchange system for imports and exports. Theoretically, the official rate is 18.75 cruzeiros to one U.S. dollar. Exporters have been getting "bonuses" of varying amounts of cruzeiros over the 18.75 rate for their products. For example, iron ore exporters get about 55 cruzeiros. This is an unrealistic value: The free market rate of the cruzeiro to the dollar recently topped 110 to 1. It is for this reason—not being able to earn approximately a dollar for a dollars-worth of exports—that many exporters in Brazil have given up.

The new government instruction which will pull the plug in the export jam up is called "Instruction 152" and was issued by SUMOC (Superintendent of Money and Credit). It gives mining companies the right to get at least $15 per ton in actual dollars to be used to amortize the original mining investment. It also will give mining companies an over-all higher rate than, say 55 cruzeiros to the dollar, in payment for dollars earned. Each mining company will have to make its own individual deal.

The result of the pulling of this minerals export plug by the government has been spectacular. Within the past several weeks, M. A. Hanna Co. has announced plans of taking over a gold and iron ore property in Minas Gerais State with probable investments running into the hundreds of millions of dollars. Cleveland-Cliffs Iron Co., combined with a group of Cyrus Eaton (Chesapeake and Ohio R.R. and steel makers) and Rockefeller interests (International Basic Economy Corp.) is winding up a deal whereby it will take control of a Sao Paulo steel company (Jafet) and considerable iron ore properties of that company in Minas Gerais State.

Other mining interests such as Kaiser Industries, Ferrostahl of Germany, Japanese groups, Polish steel and iron groups, are all hustling into government offices in Rio to get in on the new minerals export deal. Mannesmann, of Germany, which has a steel mill and steel pipe factory in Belo-Horizonte, Minas Gerais, started shipping iron ore to Germany in February at the rate of about 5,000 tons per month. Mannesmann says this figure will be raised considerably later on this year.

Actually, the instruction that set all this in motion is not a new idea. Bethlehem Steel Co. had made some arrangement similar to this new deal whereby it received so many dollars per ton on exports in order to help amortize its $65-million investment in north Brazil for manganese mining. Bethlehem is the minority holder (49% stock) of a valuable manganese property in the Federal Territory of Amapa (mouth of Amazon River) with a Brazilian company, Icomi. Apparently, Brazilian government officials were highly enthusiastic last year when it was learned that the Bethlehem Icomi mine brought in $40-million in much-needed dollars. U.S. Steel also started shipping out manganese from a smaller project in Mato Grosso State.

It appears that U.S. buyers and others will now be able to look to a new source of minerals supplies in Brazil. The most obvious front runners in the new minerals exports race will be iron ore and manganese ore. Many of these deposits run very high in metal content (iron up to 70%, manganese more than 40%).

The question now arises as to what other metals might get shipped out in the wake of the rush to iron ore and manganese. Scheelite already has been an export item for Brazil but this will probably get a much heavier play under the new instruction. Wah Chang Mining Corp. has an important scheelite works going in Brazil's northeast.

Beryl, tantalite, mica, quartz, columbite, wolframite and possibly lead and zinc might be other important items on Brazil's newly-revised export "sales catalog." These minerals can be found in abundance in Brazil (mostly Minas Gerais State) and have been lying more or less dormant for want of interested exporters.

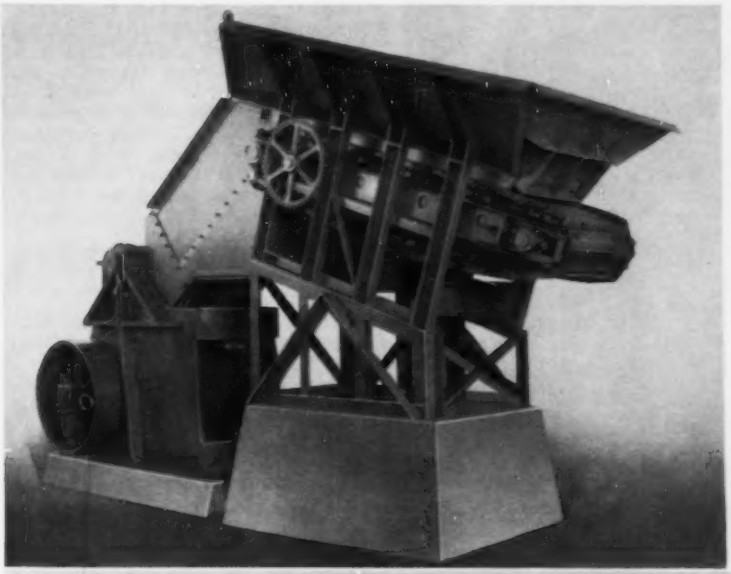
Cia. Vale do Rio Doce the largest iron ore producer and exporter in Brazil, has developed a program to increase iron ore shipments from the present annual level of 3-million tons to 6-million tons by 1960. Following that, Vale do Rio Doce expects to export from 10- to 15-million tons per year. The president and commercial director of the company visited the U.S. making arrangements in connection with their expansion program.

Rio Doce owns rich iron ore reserves in Itabira, State of Minas Gerais (total reserves estimated at approximately 2-billion tons). The Vitoria-Minas Railway, a modern, efficient railroad which carries the ore from Itabira to the Port of Vitoria, is also owned by the company. In addition, the company operates the ore loading facilities at the Port of Vitoria, State of Espirito Santo, located north of Rio de Janeiro.

In view of the expansion program, the Vitoria-Minas Railway will be equipped with additional ore cars and diesel-electric locomotives. Complete dieselization is expected in the near future. Also, existing rails are being replaced by heavier rails.

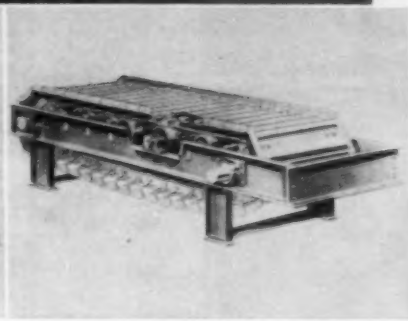
Port of Vitoria will be dredged in order to permit the loading of larger ore carriers with a 25,000 to 35,000 ton capacity. Under present conditions, the capacity of ships that may call at the Port of Vitoria is limited to 14,000 tons.

KUE-KEN® high output plants for lowest cost-per-ton crushing

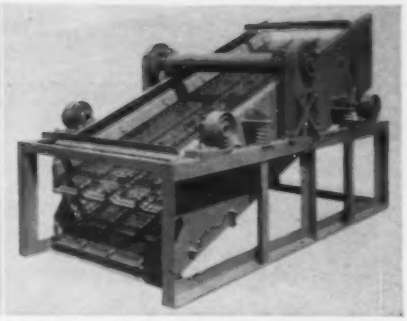


KUE-KEN 36" x 24" CRUSHER with 36" x 9' apron feeder and stationary bar type by-pass grizzley. Kue-Ken crushers in sizes from 12" x 5" to 48" x 42" as single units or in combination as shown in example (left). "Crushing without rubbing" lengthens jaw plate life 5 times or more. Built-in lubrication system avoids costly down-time. Automatic flywheel release prevents damage from tramp iron. Kue-Ken gives greater capacity for its size than any other crusher.

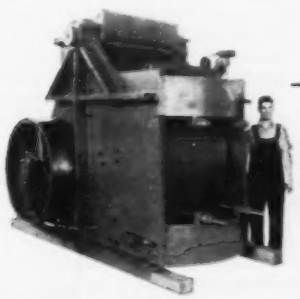
KUE-KEN GYRATORY CRUSHER fits into flowsheet where head room is limited and makes economical gyratory crushing practical in most any operation. Takes choke feed. "Crushing without rubbing" eliminates main cause of liner wear.



HEAVY DUTY APRON FEEDER. Heavy steel pans with upturned sides attached to heavy duty chain and supported on large diameter wide face rollers. Available as shown for mounting under bins or as a complete unit with hopper and gear motor drive—24" to 42" widths and various lengths.



OVERSTROM vibrating screens. Heavy duty in single, double, triple deck models up to 5' x 16'.



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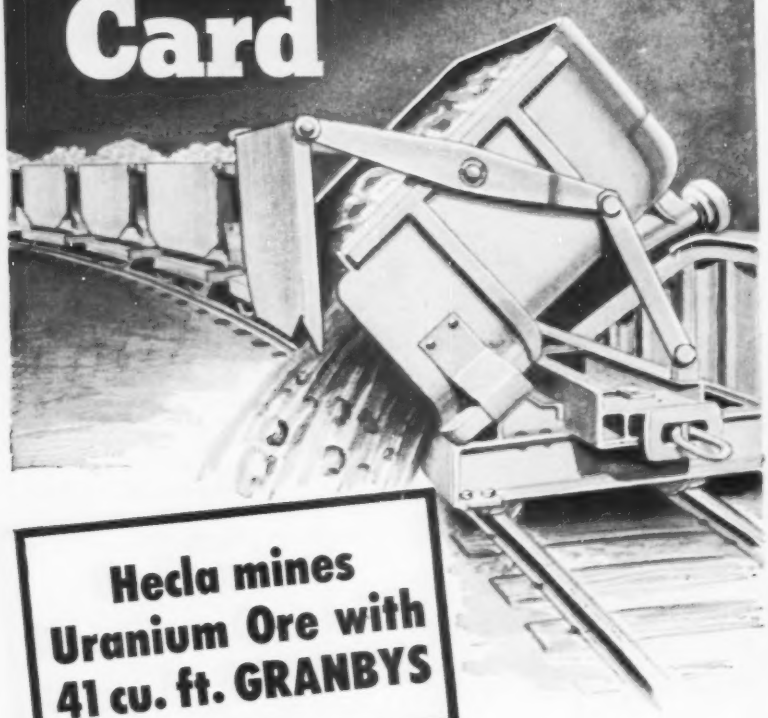
The tough ones come to Card

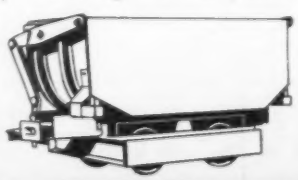


Hecla mines Uranium Ore with 41 cu. ft. GRANBYS

Hecla Mining Company opened their Radon property with 20 small Granby-type Card cars designed specifically for this underground service. Hecla is operating one of the deepest uranium mines in the U.S.A. with a well planned mine plant.

The underground haulage involves up to 300 tons per day of 0.7 percent U_3O_8 ore. Each Card Granby car has a capacity of 41 cu. ft. and is built on 24" gauge. When the Radon orebody is exhausted, the cars will still be able to "outlive" another Hecla mine of comparable size without major repair or replacement.

Such haulage efficiency and long life are yours whenever your choice is Card. Our engineers are at your service on any production haulage problem.



C.S. Card Iron Works Co.
2501 WEST 16TH AVE.
DENVER, COLORADO

Brazil *(Continued)*

Changes are being made at the company's loading installations in Vitoria to insure that these larger ore carriers can be loaded at a very fast rate.

The 6-million ton program will be accompanied by Rio Doce entering the blast furnace ore market on a large scale. The advantage that Rio Doce has over many present or potential iron ore producers in other countries is the fact that they have large reserves of lump and ore fines. Both are of extremely high grade and almost free from impurities. The ore fines, therefore, only need to be agglomerated to be used in open hearth and blast furnaces. This is in contrast to the many projects springing up all over the world where low-grade ore first has to be beneficiated in large costly plants and the beneficiated product then has to be agglomerated.

Pac-Northwest *(Continued)*

Works was described by W. H. Bierschenk, of General Electric Co. at Richland, Wash.

Speaker at the April 17 luncheon was T. S. Lovering, of the U. S. Geological Survey, Denver, Colo.

The beneficiation of autinitic ores was described by two officials of the mining experiment station of the Washington State Institute of Technology at Washington State College. William C. Aitkenhead, director, and John A. Jaekel, metallurgist, said their work had been successful in upgrading Spokane area autunite by flotation. They described research over a 16 month period on the amenability of low grade ores to froth flotation. They said the efforts resulted in high grade concentrates and excellent recoveries from some ores.

The 1958 conference included a ladies' program April 17 and 18 sponsored by the Spokane and Coeur d'Alene sections of the Women's Auxiliary to AIME.

General chairman of the conference was A. E. Weissenborn, of the Spokane office of the USGS.

Argentina Grants New Foreign Tax Concessions

FOUR DECREES WERE ISSUED recently by the Argentine Treasury Ministry, mostly comprising tax concessions in favor of share capital and commercial transaction, and encouraging the expansion of productive industry. Decrees were the last initiative on part of the out-going Provisional government to up-date the country's obsolete fiscal system, prior to its handing over the reigns to president-elect Arturo Frondizi on May 1.

One of the decrees stipulates that income derived from interest from foreign credits, granted to finance imports of industrial machinery, will cease to be liable to taxation as from April 1, 1958.

This measure was hailed in local business circles as one of the most important in years to promote foreign credits and investments.

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TISCO combination chain is made of tough, abrasion-resistant manganese steel for extra long wear. Reinforced side bars provide more bearing area, reduce pin wear and cutting.

PINTLE CHAIN

Used in elevators, conveyors, etc., rugged TISCO pintle chain actually becomes tougher as it wears and is unsurpassed for durability.

DRAG CONVEYOR CHAIN

TISCO drag conveyor chain is noted for its phenomenal wearing qualities and is used for the horizontal transfer of heavy stone, cement, chemicals, etc.

DRAG LINE CHAIN

Embodying exceptional hardness and extremely long-wearing properties. TISCO drag line chain is designed to provide full bearing between links and outlasts others by 500%.

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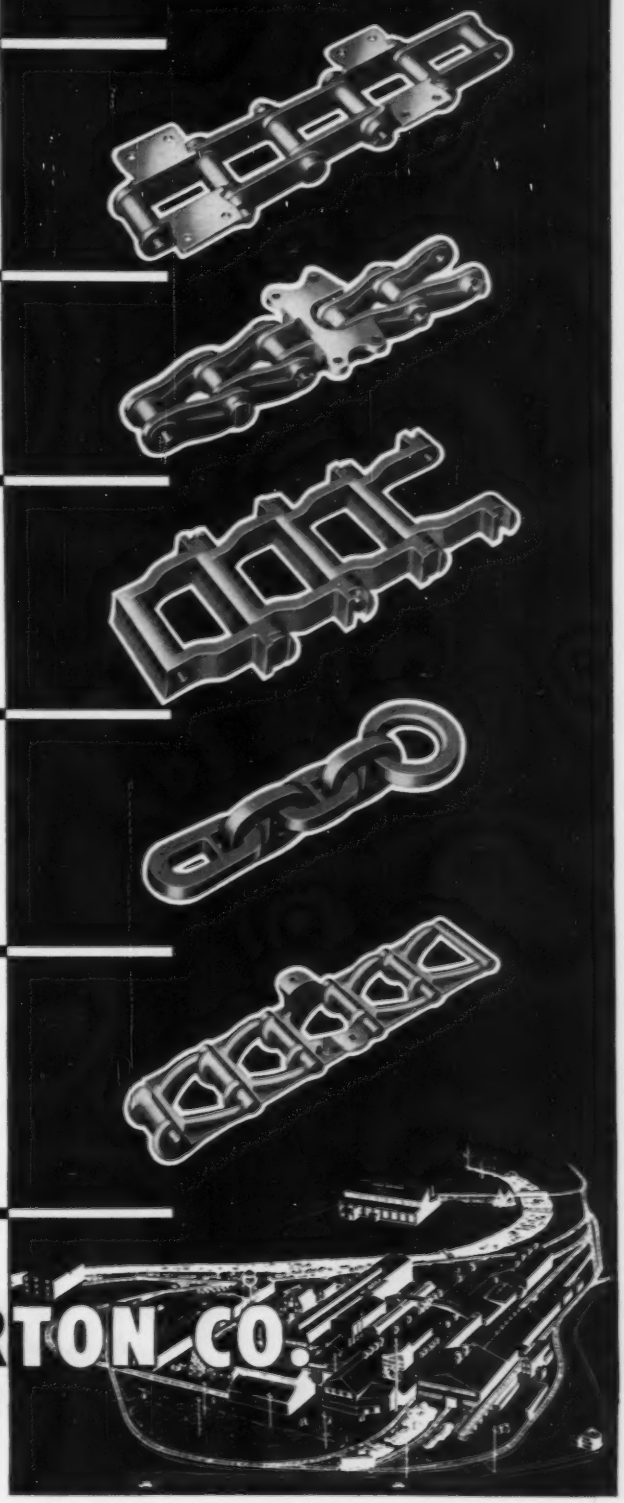
Used for light and moderate speed drums, conveyors and elevators, TISCO detachable chains are simple to assemble yet cannot become uncoupled while in service. For details on all TISCO manganese steel chains contact:



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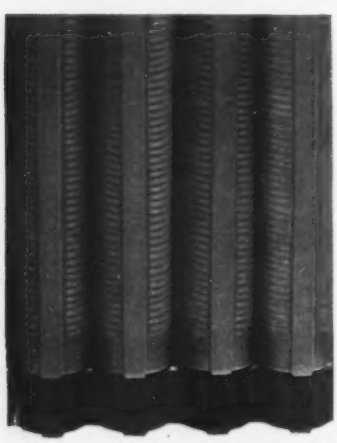
Total work output, not mere price, is the key to battery economy. When you buy batteries, specify Exide-Ironclad and get the most production capacity your dollar can buy. For details, write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.



High-capacity, long-life tubular construction. Gives positive plate one-third more surface area for greater power reserve. Power tubes hold active material securely for long battery life.

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Argentine Tax (*Continued*)

shares as was at one time thought possible. On the other hand, however, dividends are encouraged in tax-free shares, provided they are not disposed of within five years of payment. The idea is to stimulate capital expansion of companies.

For the companies themselves there is no actual revaluation of fixed assets as yet, but more liberal and graduated allowances are made for amortization. Another important concession is in regard to the actual computation of excess profits.

General concessions include reforms of the regulations concerning capital gains. Taxes are remitted in certain cases where the proceeds of sales are reinvested in similar or other productive enterprises.

Mines, quarries and similar establishments will derive substantial benefits from the application of the new tax provisions. The "straight line" method of amortizations based on the actual cost of investments is now being replaced by the deduction of 10% of gross sales in the case of new enterprises. When a substantial extension of an existing enterprise is involved, a proportional percentage will be applied.

The 10% base percentage in the case of mining activities will be applied during 15 years from the commencement of extraction. Deductions thus granted, it is held, may not exceed 50% of net profits calculated before the application of this benefit.

Mining Calendar

13th Purdue Industrial Waste Conference & Exhibit. Convention Hall, Philadelphia, Pa., Sept. 15-19

Rocky Mountain Minerals Conference, AIME, Salt Lake City, Sept. 17-19

American Mining Congress, San Francisco, Calif., Sept. 22-25

Metallurgy '58 — Norwegian Industries Development Assn., Oslo, Oct. 15-26

7th National Clay Conference, U.S. National Museum, Washington, D.C., Oct. 20-23

Mid-America Minerals Conference, Society of Mining Engineers, AIME, Chase-Park Plaza Hotels, St. Louis, Oct. 23-25

Metallurgical Society of AIME, Fall Meeting, Detroit, Mich., Oct. 27-30

4th Annual Symposium on Mining Research, Missouri School of Mines, Nov. 13-14

Columbia Honors Krumb

HENRY KRUMB, consulting mining engineer and Columbia University School of Engineering (School of Mines) alumnus (1905), was honored as founder of the Henry Krumb scholarships, at a testimonial dinner held at the Columbia University Club, 4 West 43 St., New York City, on April 11. Present at the informal gathering were 28 guests, including Dean John R. Dunning of the Columbia School of Engineering, members of the School of Mines faculty, and former recipients of the Henry Krumb scholarships. The recipients of the awards for the coming year, given annually to the most promis-

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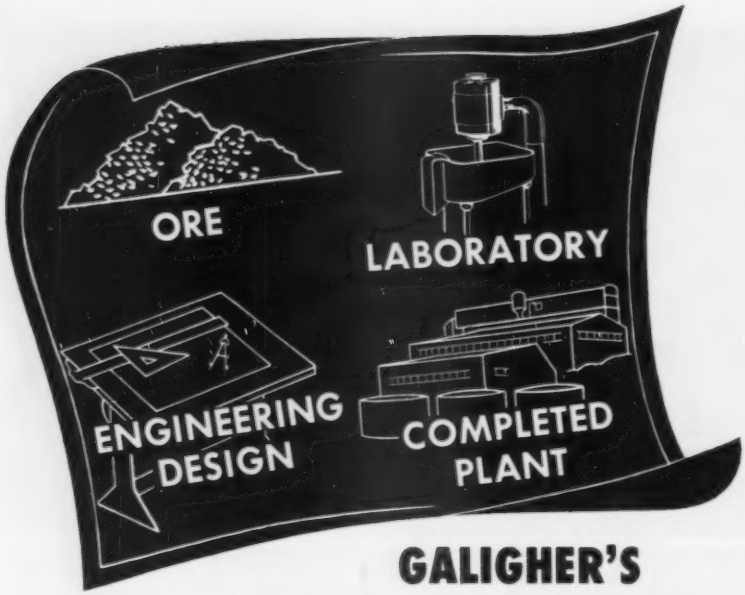

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Krumb *(Continued)*

ing and outstanding students in the School of Mines are: Richard W. Hoppe, Maurice Gell, Ronald M. Hays, and Walter F. Schnabel.

AEC Authorizes Private Sales of Concentrates

PRIVATE SALE of uranium ores and concentrates (subject to licensing) has been authorized by the Atomic Energy Commission. Sales may be made to domestic or foreign buyers for peaceful uses of atomic energy.

In its announcement, the Commission noted that the current and future output of the U.S. mills will "meet the needs of the Commission for the next several years and also take care of the commercial demands as U.S. industry establishes new outlets. The Commission will consider the release of uranium under contract to the AEC. Releases will be subject to such contract modifications as may be deemed appropriate."

Radioactive Tracers in Metallurgy Are Studied

BASIC RESEARCH WORK in application of radioactive tracers to metallurgical process has been authorized by the United States Bureau of Mines at Intermountain Experiment station, Salt Lake City and Reno, Nev., station.

J. Bruce Clemmer, director of the station at Salt Lake City said renovations already had been completed at the plant on campus of the University of Utah.

Mining men in Salt Lake City forecast a possible "metallurgical revolution" in use of tracer substances.

The tracers are believed applicable as well to iron ore beneficiation. Substitution of pH counters, time and volume controls are possible in greater automation of beneficiation units.

Mr. Clemmer said first work on the tracer line will be on isotopes of one millicurie of activity, equal to 37-million radiations per minute.

Immediate projects at Salt Lake City involve bench work on radioactive manganese, iron, nickel, cobalt and silver-tagged clays.

The studies are under the immediate direction of H. L. Gibbs and H. E. Peterson. They also will include research into flotation, leaching, and smelting of manganese ores; extraction and production of pure nickel and cobalt; segregation and recovery of copper from oxidized ores; etc. After testing on bench basis, the tracer techniques will be tested in pilot mill (concentrator).

Glazed walls and other safeguards have been provided for mines' employees at work with isotopes.

Bunker Hill's Crescent Wins State Safety Prize

BUNKER HILL Co's Crescent Mine near Kellogg was the safest "small" mine in

Roasting Supt. Charles Noonan, The Bunker Hill Co. Electrolytic Zinc Plant, Kellogg, Idaho. ESCO Spacer Casting exhibited by Noonan has been removed for inspection after 18 months of continuous service and is still in perfect operating condition.

"ESCO ROASTER ARMS LAST 2 TO 3 TIMES LONGER

and saved us $12,000 in original cost"

"Since we started using *ESCO* Roaster Arms, two and one-half years ago, we have gotten more than two full year's service from most of them and 90 per cent of them are still going strong," explains Roasting Superintendent Noonan, Bunker Hill Co.

"Operating conditions here are among the most severe to be found anywhere," Noonan continues, "but the high heat and heavy concentration of sulphur dioxide gas in the roasters just doesn't seem to hurt the *ESCO* parts nearly as much as the previous ones." And *ESCO* Roaster Arms can be successfully welded in the event of damage.

ESCO Roaster Arms are "job-tailored" to individual operating conditions for longer life and lower operating costs. For help with all your problems of corrosion, heat and abrasion, call or write an *ESCO* engineer today.

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Crescent *(Continued)*

the State of Idaho during 1957, according to an announcement made today by the state Mine Inspector's office.

Members of the Crescent crew won by a wide margin, with only two accidents for a total of seven days lost time reported for the year.

In presenting an inscribed plaque to the men who made the record possible, State Mine Inspector George McDowell said this was an outstanding record of achievement, made during development work and while working 5,000 more man hours in 1957 than in the previous year. In 1956 the Crescent Mine placed second in the safety standings.

K. T. Price, Freeport, Dies

KENNETH T. PRICE, Freeport Sulphur Co. vice-president, died of a heart attack on May 11 at Port Sulphur, La.

A native of Whiteboro, Texas, Mr. Price was a member of AIME, the Louisiana Engineering Society and the Petroleum Club of New Orleans. He joined Freeport as an engineer in 1925 and became its vice-president in charge of Louisiana producing operations in 1952.

Patent Upheld

CANADIAN COURTS recently upheld a patent on the Riddell shaft mucker (J. Murray Riddell, consulting engineer, Houghton, Mich.) by awarding, in his favor, an injunction and damages for patent infringements. Riddell's mucker is also patented in the U. S.

IN THE U.S.

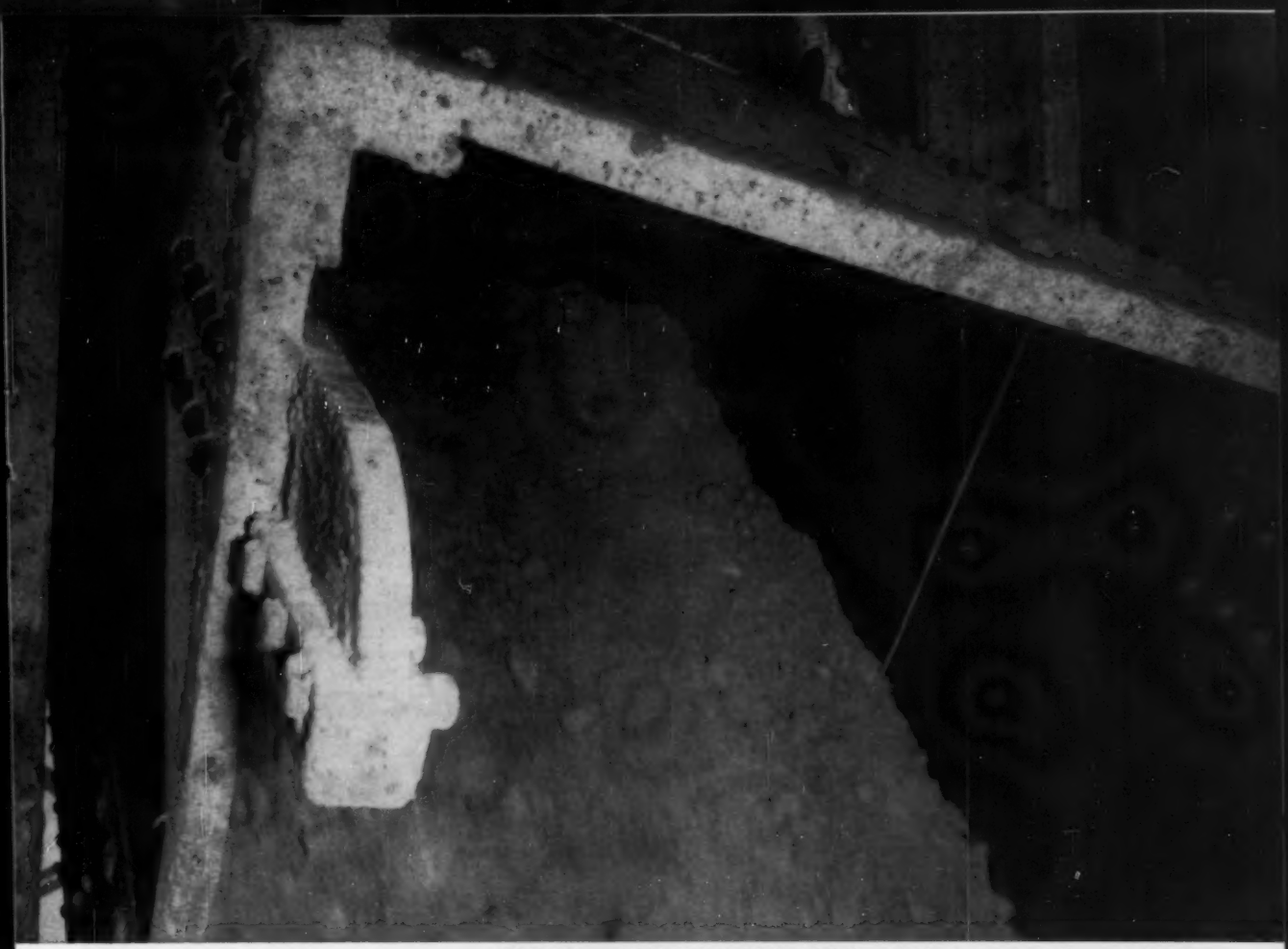
ARIZONA

Orphan mine of Western Gold and Uranium, Inc. at Grand Canyon is now producing 50 tpd uranium ore averaging 1% U_3O_8.

Sinking of a deep vertical shaft has begun. Centennial Development Co. of Eureka, Utah is contracting the shaft which will be 1600 ft deep. After completion of the shaft, production is planned for 200 tpd.

CALIFORNIA

Natomas Co., Sacramento gold-dredging firm, is intensifying its mining exploratory activities in an effort to put its idle dredging equipment to use. The firm has been forced to shut down one dredge due to exhaustion of reserves in the Folsom area. Income from gold dredging for the calendar year 1957 skidded to $1.2-million from $1.7-million the previous year. Net returns per yard were down from 1.42c in 1956 to 0.23c in 1957.



Skip bucket liners of USS "T-1" Steel cut dead weight, last longer, cost less to replace than the liners previously used.

"T-1" Steel doubles the life of skip bucket liners

—reduces weight by ½ ton

Skip hoist at Miami Copper Company Mine, Miami, Arizona, hauls abrasive copper ore up a 1080-foot shaft, making 80 trips per hour.

This skip hoist at the Miami Copper Company Mine, Miami, Arizona, has two skip buckets which weighed 19,350 pounds each. The old liners, made of structural carbon steel, consisted of 1-inch-thick bars riveted to ⅜-inch-thick plates. By replacing this arrangement with ½-inch-thick plates of USS "T-1" Steel, weight was reduced by almost half a ton.

The present USS "T-1" Steel front dumping-lip liner and the side liners last more than twice as long as the previous liners. What's more, fabrication costs for a complete lining have been reduced by more than 90%, and replacement time cut to a fraction.

What USS "T-1" Steel can do for you. This versatile steel has a combination of properties unexcelled for mining equipment. It has nearly 3 times the yield strength of structural carbon steel, outstanding resistance to impact abrasion, exceptional toughness, even at temperatures as low as —50°F., and is readily weldable without preheating.

This means you can get rid of dead weight and lower your costs by using USS "T-1" Steel for dippers, sticks, booms, chutes, hoppers, cars, and other equipment. Write for our booklet, "Mining's Metal, USS 'T-1' Steel." United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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United States Steel Corporation – Pittsburgh
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Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
United States Steel Export Company

United States Steel

Why use a

DIAMOND *bit?*

Diamonds do the job better . . . for less. In many applications, one diamond bit performs the work of several ordinary bits. Under certain conditions only diamond bits will do the job where nothing else can make hole, and only diamond core bits and barrels guarantee maximum core recovery under varying conditions.

Why use a

CHRISTENSEN *diamond bit?*

Christensen diamond equipment is engineered to the job, giving best results in any formation. Christensen sells not only the diamond equipment, but also offers the services of a qualified field engineer whose education, experience and "on-the-spot" availability can prove of tremendous value to the operator. Wherever there is mining activity, anywhere in the world, there is a qualified Christensen engineer for consultation on any drilling problem and ready to provide the specific diamond equipment needed for your job . . . now, and in the years to come. Call Christensen, and operate at "less cost per foot."

Do you have our catalog? Write today for SD-507

CHRISTENSEN DIAMOND PRODUCTS

1937 SOUTH 2ND WEST • P. O. BOX 387 • SALT LAKE CITY, UTAH

California (*Continued*)

The firm's net income for 1957 amounted to $3.6-million compared with $1.5-million the previous year. The increase was due to earnings from non-mining activities, mainly the company's interest in two steamship lines.

A civil service examination for the position of Chief of the Division of Mines, recently vacated by the retirement of Chief Olaf P. Jenkins, was announced by the California State Personnel Board.

Examination has been set for July 19, 1958, with final application date of June 20. Applicants should have broad professional experience in geology or mining engineering, at least five years of which should have been in administrative or executive direction of geological or mining work, including field investigations and technical reports.

The salary starts at $1050 per month.

COLORADO

United Gold Mines Co., Cripple Creek, for the year ended Dec. 31, 1957, says net loss was $65,694.92 (after charging off depreciation and amortization in the sum of $11,225.83); compared to a net loss for 1956 of $34,217.40 (after charging off depreciation and amortization in the sum of $11,466.13).

Climax Molybdenum Co., division of American Metal Climax, Inc. has plans for the sinking of a 700-ft circular shaft, 19 ft dia, which will be the first vertical shaft sunk by Climax since 1933—Its Climax mine in Colorado has been developed mostly through tunnels. The new No. 4 shaft is to permit development of a new production level 300 ft beneath the Storke level and to allow access to another level 600 ft below the Storke which will be explored. It will be sunk from the Storke level at a point more than a mile into the mountain from the Storke portal. Completion date is set for the end of the year.

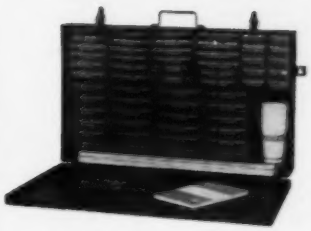
The Colorado Supreme Court has ruled that a geiger counter can legally be used to prove a uranium claim. The Court, in upholding a Park County decision, said: "Radiometric results coupled with other evidence such as chemical assay tests on part of the claim comply with state requirements in filing discoveries."

William B. Specht, president of S. N. N. Mining Co. Inc., Cheyenne, Wyo. announced that his company has obtained a lease on the famous Williams Group of silver mines near Rosita, Colo. and that work will be started in about 60 days. He also stated that their future plans include the building of a mill.

Rocky Mountain Standard's name has been changed to Rocky Mountain Mill & Chemical Co. The Boulder firm holds patents for uranium milling. One is an upgrader for low-grade ores; the other is a flocculating agent now being manufactured in volume lots for use in uranium milling as well as in other fields where separation by precipitation of solids is a problem.

M-S-A® Type D ALL-WEATHER FIRST AID KITS

When emergencies call for first aid, these kits provide all the advantages for quick, complete treatment. Unit packages, easily replaced, are arranged for fast selection, contain one or more complete dressings or treatments for each injury. All dressings are sterilized and ready for use. Cellophane package wrappings protect contents. The kits, available in 10, 16, 24, and 36 units, are made of 20-gauge steel, with carrying handle, and mounting brackets. Case is dust and moisture-proof. Ideal for carrying on jeeps, motors or other mechanized equipment. Complete instructions with each kit. Write for details.

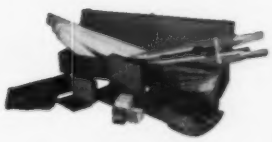


M-S-A MINER'S FIRST AID CABINET

Contains complete assortment of first aid material and supplies. Ideal for mine hospital or dressing stations. Contents conform to U. S. Bureau of Mines recommendations.

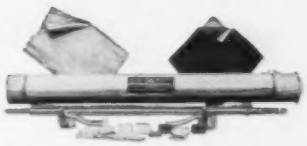
M-S-A FOILLE BURN KIT

Contains four 10-ounce Foille Aerosol Sprays, easy-to-use Type D first aid dressings and accessories. Stored in All-Weather steel case. Permits fast effective burn treatment.



M-S-A EMERGENCY FIRST AID OUTFIT

Ideal for storage underground where a compact unit is needed. Contents selected to meet practically every emergency. Includes two first aid kits, blankets, splints, Redi-Heat Blocks, stretchers. Sturdy steel case.



M-S-A STANDARD STRETCHER OUTFIT

Complete assortment of first aid dressings and supplies arranged in a strong dust-proof canister. Contains stretcher, blankets, first aid materials, splints. Designed for first aid rooms, dressing stations.

MSA . . . headquarters for First Aid Equipment

Above are a few of the many first aid supplies and treatments available from M-S-A. This material is the result of years of experience in serving the mining industries' requirements.

Our knowledge of emergency needs has developed the design and contents of our first aid line.

You will find complete information in our Mining Catalog••••28 pages are devoted to illustrations and detailed information on these and many other first aid supplies. We will be happy to send you a copy upon request.

MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M-S-A is at your service . . . our job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Calgary, Edmonton, Montreal, Sydney,
Vancouver, Winnipeg.

GET INTIMATE CONTACT of ore and acid, for highest extraction percents, with turbine-type LIGHTNIN Mixers like these. Hundreds of standard power-speed combinations; 1 to 500 HP. For details, request Catalog B-102.

Good mixing *helps push out half-ton per minute of U308*

More often than you might think, the payoff is in the *mixing* phase.

Good mixing of fluids helps this large Colorado plant extract uranium and vanadium with high efficiencies. The plant is designed for 30 tons/hr. of 75-80% U308 and 90% V205 concentrates, from ores averaging 0.2-0.3%.

In the dissolving tanks you see here, turbine-type LIGHTNIN Mixers put into the mix the *exact balance of fluid flow and turbulence* that will produce highest possible extraction values—by actual test.

LIGHTNINs do all these jobs

In the same plant, four LIGHTNINs mix crushed ore with leach liquor. Five others mix sand and ore slimes to prepare for releaching. Six more blend leach liquors.

Each unit is engineered specifically to do its job with maximum effectiveness.

Installation was simple, because all LIGHTNINs are shipped fully assembled, factory-aligned and ready to install. All are built of standard interchangeable components to keep maintenance and parts replacement simple. All parts are easily accessible for servicing.

Results guaranteed

Have you a tough mixing job to do? You can get a LIGHTNIN Mixer to handle it—with results *fully predictable, unconditionally guaranteed.*

For fluid mixing that helps you get more out of your ore, call your LIGHTNIN representative now. (You'll find his name in Thomas' Register.) Or write us direct.

Lightnin® Mixers

MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 234-f Mt. Read Blvd., Rochester 11, N.Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Avenue, Toronto 10, Ont.

Colorado *(Continued)*

Lisbon Uranium Corp. has been presented a check for $61,016.72, evidence the firm was the only winner of a $10,000 bonus offered 10 years ago for production of 20 tons of 20% U_3O_8.

Ore samples from the El Paso's Bossie stope at Cripple Creek are still assaying near an ounce of gold per ton after nearly four months of steady operation. El Paso superintendent, Earl Robush, said that the stope has reached nearly 50 ft in height with a maximum width of about 8 ft.

"Just what the limits of the good ore are," said Robush, "we are still unable to determine." The El Paso mine has made a record gold output of $10.8-million since its discovery.

Pinnacle Exploration, Inc. the operating company for all Callahan Zinc-lead Co. and Vulcan Silver-Lead Corp. operations in Colorado, continued exploration for uranium throughout 1957 in the Marshall Pass area of Gunnison and Saguache.

Homestake Mining Co. continues to hold its 11.11% interest in Idarado Mining Co. which owns and operates mining properties between Ouray and Telluride. Idarado's operations were continuous throughout 1957. Net income for the year amounted to $555,938, as compared with $1,072,115 in 1956.

Alva A. Simpson, Jr., president, United Western Minerals Co., and Merrill E. Shoup, president, Golden Cycle Corp., announced that the two companies have concluded a working agreement through which they will jointly make application to the Atomic Energy Commission for a milling contract enabling them to construct additional facilities at the Carlton Mill in the Cripple Creek District for the processing of Colorado Front Range uranium ores.

IDAHO

Federal Uranium Corp., Salt Lake City, has agreed to enter a new phase of development at the Conjecture silver mine in the Coeur d'Alene district.

According to notification given officials of Conjecture Mines, Inc., Federal will exercise its option to earn a 50% interest in the properties by bringing the mine into production.

This entails sinking of a three-compartment shaft to the 1,000 ft level and installation of a hoist and a surface plant. Stations will be cut in the shaft at 700 and 1,000 ft levels, respectively.

At their annual meetings in April stockholders of Callahan Zinc-Lead Co. and Vulcan Silver-Lead Corp. ratified by overwhelming majorities a proposal to merge the two affiliated firms. Callahan Zinc-Lead will be the surviving company under the name of Callahan Mining Corp. All outstanding Vulcan stock will be exchanged for Callahan shares on a share-for-share basis, except that held by the Callahan Co. (61.3% of the total) which will be cancelled.

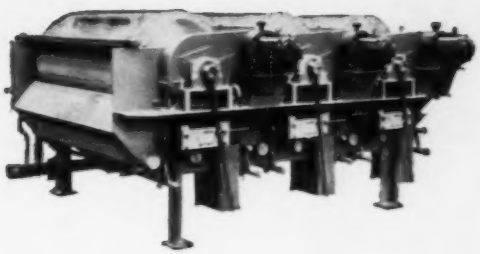
For wet concentration and magnetic recovery,

JEFFREY DRUM-TYPE SEPARATORS

Extremely Simple: The drum is the only moving part and there are no slip rings or contact brushes. An entire plant can be handled by one man.

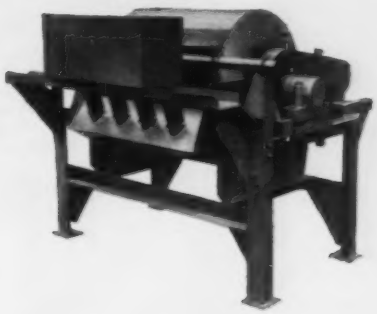
Highly Efficient: Close clearance between magnet poles and drum result in very little magnetic loss. Alnico permanent magnets can often be substituted for electromagnets.

Easily Adjusted: Intensity and depth of magnetic field can be suited to various separation problems by mechanical and electrical adjustments.



Finishing Type Separator

Provides a strong, positive washing action, since materials washed from the drum go back into the feed well for re-separation. Double or triple-drum counterflow finishing separators can be adjusted to deliver a middling product clean and substantially free of tailings and concentrate particles.

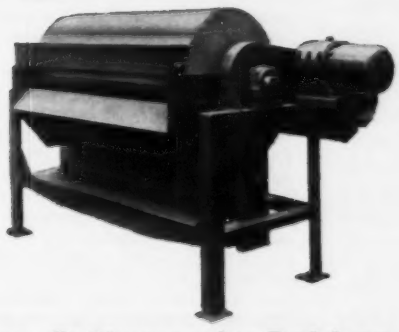


Type CO Separator

This counterflow overflow type was designed for the recovery of magnetic medium in a standard heavy-media plant. Compact, it saves floor space and headroom. Has extremely high capacity both from a pulp volume and magnetic solid carrying-capacity standpoint and also produces tailings extremely low in magnetics.

Type CS Separator

The spigot design differs from the Type CO in that a spigot discharge is provided for the relatively coarse particles. It is designed for use in fine ore treatment plants, where it is necessary to pass the sink and float products through magnetic separators, instead of relying upon drainage screens to remove the medium from these products.



Type C Magnetic Cobber

A high intensity unit for producing tailings of lowest possible magnetic iron content. Eliminates barren gangue in coarse sizes, thereby cutting grinding costs; lowers plant tailings.

THE JEFFREY MANUFACTURING COMPANY
974 North Fourth Street, Columbus 16, Ohio

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CONVEYING • PROCESSING • MINING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Idaho *(Continued)*

Clayton Silver Mines expects the new 800 level to develop nearly 300,000 tons of new ore reserves when it is completed. Sinking operations and station cutting are expected to be completed about the middle of this year and crosscuts will then be started toward the north and south orebodies. The new reserves will add eight to 10 years of operating life to the mine, with production at mill capacity of 100 tpd.

American Smelting and Refining Co. and Jack Waite Mining Co. have concluded a new 99-year lease and agreement covering operation of the Jack Waite Mine on the Idaho-Montana border in the northeast sector of the Coeur d'Alene District. New contract supersedes the 40-year lease under which Asarco has operated the property since 1934, and it provides for an extensive exploration and development program, a revised profit-sharing ratio and a new smelter contract.

Asarco has agreed to spend a minimum of $100,000 on exploration and development at the property over a period of 27 months. This capital outlay is subject to reimbursement in full out of first profits from production, except that Jack Waite will receive a 10% royalty on any net profits during the first year of the contract. After development costs have been reimbursed, profits will be divided 55% to Asarco and 45% to Jack Waite.

Silver Dollar Mining Co.'s initial diversification venture into oil exploration has met with unusually gratifying results. The first two wells put down on a 200-acre Oklahoma tract in which Silver Dollar has a 25% interest hit oil at a depth of about 3300 ft. Both flowed at the high rate of about 50 barrels per hour in initial production tests from a 22-ft. width of oil sand at that horizon.

Coronado Copper and Zinc Co., Wholly-owned subsidiary of Cyprus Mines, has closed the exploration field office it has maintained in Wallace for the past several years and is reported to be closing all similar offices in line with a complete change of company policy with respect to exploration activity. Company plans to retain its Cortez Silver-Lead property on the Idaho-Montana border in the eastern part of the Coeur d'Alene District, but henceforth will handle its affairs through company headquarters in Los Angeles.

Polaris Mining Co. has completed a crosscut through the zone of favorable ore disclosed by diamond drilling early this year beneath Rainbow Mining & Milling Co. property, and initial exposures show a wide zone of intermittent mineralization with indications of one or more north-south striking vein structures. Geology of the area is extremely complex and company officials say that considerably more exploration work will have to be done before the mineralized structures can be correlated and evaluated. Now in progress is an east drift toward a drill intercept some 250 ft away which showed about 97 oz Ag per ton across 2.8 ft of core.

Lucky Friday Silver-Lead Mines Co.'s deep development program is progressing on schedule and ore reserves at the property east of Mullan are currently estimated to be sufficient for nearly 20 years operation at the present production rate of 40,000 tons per year. The orebody is now being drifted out on the new 2600-ft level.

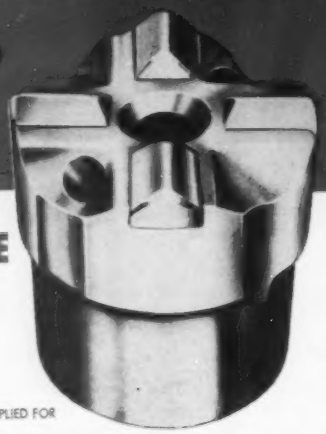
Easterly drifting on the 3700 level of the Yankee Girl vein beneath Metropolitan Mines Corp.'s property in the Silver Belt between Kellogg and Wallace has opened about 40 ft of new high-grade silver-copper ore beyond a crossfault which cut off the ore and caused suspension of the drift work about 10 years ago. This increases to more than 80 ft the potential stope length of ore exposed in the old and new drifts. The ore carries excellent silver values and ranges from one to three ft wide.

KENTUCKY

Anaconda Co. has announced the acquisition of Cochran Foil Co., Louisville, manufacturer of aluminum sheet, foil and laminated foil products. All the assets

LIDDICOAT

. . . the tungsten carbide bit that needs no resharpening



SPECIAL LONG LIFE INSERTS...FAST CUTTING ACTION

PATENTS APPLIED FOR

The exclusive shallow long life inserts need no resharpening because they do not develop a reverse taper dullness . . . a condition that stops drilling in the conventional multi-use bit. The exclusive design of LIDDICOAT permits fast drilling far beyond the point where conventional multi-use carbide bits must be withdrawn from service for resharpening. Fast drilling continues during the entire bit usage without need of resharpening. Lower first cost – low cost per foot of hole drilled.

Taper socket — No threads — Fast, firm attachment

The type TS Tee Cee Liddicoat (no resharpening) bit has a completely new short taper socket connection. Within the socket of the bit is a brass shim. The socket, which is completely forged, is tapered to correspond to the taper placed on the drill rod. The connection assures an absolute attachment to the rod, and yet permits easy removal.

FOR ALL SIZES OF DRILL ROD — 7/8" TO 1½"
FORGED FOR TOUGHNESS FROM NICKEL ALLOY STEEL

WESTERN Rock Bit Manufacturing Company
552 West 7th South • Salt Lake City 1, Utah

Worried about rock falls? Bolt the roof!

An ideal way to minimize the danger of severe rock falls is to use Bethlehem headed roof bolts. Used with leaf-type expansion shells, these long bolts control the roof because they lock themselves in drilled holes, anchoring the overlying strata into a supporting beam.

In addition to promoting safety, Bethlehem roof bolts permit wide openings and clearances, enabling mechanized equipment to work close to the face. Ventilation is improved, due to the absence of bulky supports. There's less need for storage space, both above and below ground. And there is no fire hazard to worry about.

Headed Bolts Made in Three Types

Bethlehem headed roof bolts come in these three diameters: ¾ in. carbon, typical breaking load 24,000 lb; ⅝ in. high strength, typical breaking load 24,000 lb; ⅞ in. high strength, typical breaking load 45,000 lb. We also produce a 1-in. slotted roof bolt, which is used with a steel wedge.

If you would like full information about Bethlehem roof bolts and accessories, get in touch with the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Another Continental "first"

Belt-Powered

Hydraulically Operated Tripper

Developed entirely by Continental, this patented hydraulic tripper was specifically designed for handling explosive, corrosive or similar materials where electric trolley wires and cable reels would present a hazard. Elimination of electrical equipment and mechanical reversing mechanisms, together with their required maintenance, make it an attractive installation for handling all bulk materials.

The unit, fully equipped with hydraulic controls, receives power from the conveyor belt and transmits this power through a hydraulic system to the tripper wheels. There are no clutches or friction drives to corrode during down time. The hydraulically operated spring-set brakes provide tripper positioning without creep, crawl, or accidental release.

Consult your nearest Continental office for complete information.

• *On any conveying or materials handling problem, consult your nearest Continental office.*

CGC

INDUSTRIAL DIVISION

Continental Gin Company

BIRMINGHAM, ALABAMA

ATLANTA • DALLAS • KNOXVILLE • MEMPHIS • MOBILE • NEW YORK 17

Kentucky *(Continued)*

and properties of Cochran Foil Co. have been transferred to Cochran Foil Corp., a new Anaconda subsidiary headed by Archibald P. Cochran. Mord Lewis, executive vice president of Anaconda Aluminum Co., was elected a vice president of Cochran Foil Corp.

MAINE

A hitherto unreported deposit of iron-manganese ore has been revealed by a geologic and aeromagnetic reconnaissance survey made by the Geological Survey of the Maine Department of Economic Development.

In announcing the discovery Commissioner Fred A. Clough, Jr., said that while the full outlines of the occurrence are not yet known, it is of sufficient interest to warrant further exploration by commercial mining firms. The initial discovery, centered in southeastern Penobscot County, has been followed about eight miles. Over that length the formation appeared to be about a quarter-mile wide.

The iron-manganese occurrence was discovered, Commissioner Clough said, during aerial reconnaissance mapping in and around Greenfield.

MICHIGAN

Inland Steel's Sherwood and Bristol mines on the Menominee range loaded their first cars of ore April 21. In 1957 the mines began loading ore March 18. The first boat pushed its way through the ice into the Escanaba docks on April 1, 1957. This year the first freighter appeared about May 1.

The spring meeting of the Lake Superior Mines Safety Council was held at Caspian April 3. Dr. Edgar L. Harden, president of Northern Michigan College, Marquette, made the principal talk. Other papers were given by Jack H. Morrow, operating engineer, M. A. Hanna Co., on "Safety Aspects of Shaft Sinking at the Homer-Wauseca Mine"; attorney Bernard H. Davidson on "Michigan's Workmen's Compensation Laws"; James Unger, Duluth, assistant to the supervisor of industrial relations, Pickands, Mather & Co., "The Foreman and Safety", and Joseph B. Stepan, Duluth, U. S. Bureau of Mines, "Prevention of Fall-of-Ground Injuries."

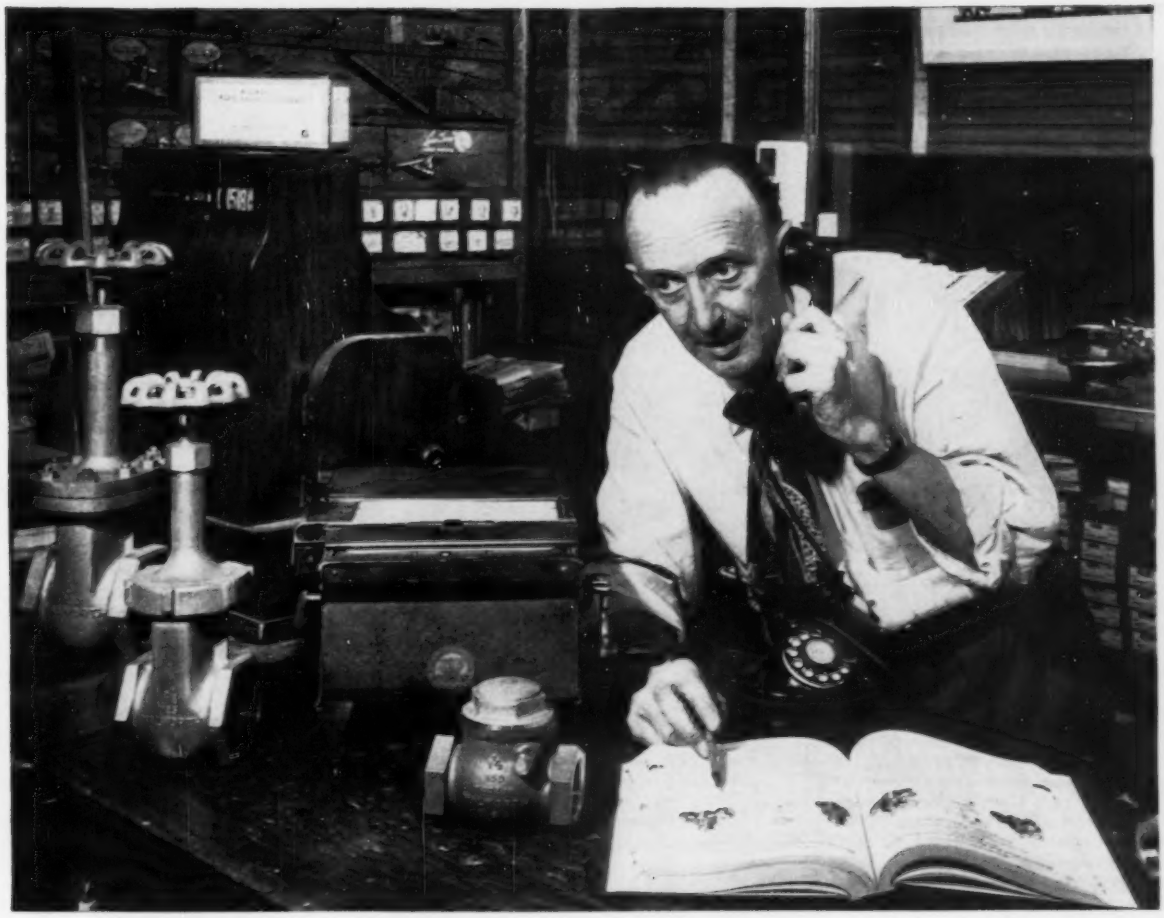
MINNESOTA

Oglebay-Norton Co., Cleveland, has been appointed exclusive sales agent for 1½ million tons of Reserve Mining Co. pellets produced at its Silver Bay plant for 1958 delivery. The pellets have a natural iron content of about 61%, silica 7.35% and phosphorus 021%.

The washing and intermediate ore separation plant at M. A. Hanna Co. Douglas mine began operating April 21,

(Minnesota continued on page 143)

Changes at the refinery would be made



*Fictitious name used to typify over 400 Walworth Distributors

Here's why it pays to do business with distributors like Mr. Hansen*

Andy Hansen is typical of Walworth Distributors throughout the nation. He has been a distributor of Walworth Valves and Fittings for years. Like Andy, the Walworth Distributor in your area provides these services and savings:

He reduces your inventory costs. He's aware of the valve and fitting needs peculiar to his area. He stocks the products that will best serve your needs. Deliveries are always prompt and economical – emergency orders can generally be delivered within hours.

He offers you application and engineering assistance. His technical experience can be invaluable in solving your particular problems. He has 50,000 Walworth products at his disposal. You can be sure that the items he recommends are exactly right for the job.

He is a double guarantee. His business depends upon providing you with the very finest products and unsurpassed service. Every valve and fitting is backed by his own reputation and that of Walworth – a complete line manufacturer.

There's a Walworth Distributor near you ready to help. Call on him today.

WALWORTH

valves . . . pipe fittings . . . pipe wrenches

750 Third Avenue, New York 17, N. Y.
Walworth Company of Canada, Ltd., Toronto

(Minnesota continued on page 143)

ELECTROLYTIC OUTPUT at the Garfield refinery, now owned by Kennecott Copper Corp., will be increased by some 4,000 to 5,000 tons per month in 1959.

Kennecott Will Increase Garfield Capacity

KENNECOTT COPPER CORP. has scheduled improvements at the Garfield Smelter, Garfield, Utah, amounting to between seven and eight million dollars.

The firm's Utah Copper Division also plans to increase capacity of the electrolytic refinery at Garfield by 4,000 to 5,000 monthly to between 20,000 to 21,000 tons of electrolytic monthly.

Changes at the Garfield smelter will be made after Kennecott takes possession on Jan 2, 1959. Kennecott recently announced purchase for $20-million cash of the smelter from American Smelting & Refining Co. The expansion of the refinery at Garfield, along with additions to be made at the Baltimore electrolytic refinery now under construction, were programmed as part of a $111-million "integration plan" discussed by KCC president Charles R. Cox at annual meeting of shareholders at New York.

Mr. Cox said that these expenditures would come to $35-million and that the purchase price of the Garfield smelter was not included in the sum.

While the exact program at the smelter has not been set, *E&MJ* was informed that Kennecott has under consideration:

1. Elimination of roasting of concentrates prior to treatment in reverberatory furnaces. This would eventually lead to replacement of the present reverbs with larger units.

2. Transport of the concentrates via pipeline directly from the Arthur and Magna mills, eliminating freight haul from the mills to the smelter. The concentrates would be dried at the smelter.

Kennecott already has announced its plans to cease custom smelting at Garfield, which would end the custom department there.

(Major shipper other than Kennecott to the Asarco smelter was Calera Mining Co. However, prior to the sale, Calera's copper concentrates from copper-cobalt mill at Cobalt, Idaho, were diverted to Asarco's Tacoma, Wash., smelter.)

By additions to the electrolytic plant at Garfield, Kennecott would be able to treat the entire output of blister from the smelter. At present an estimated 75% of the output is being treated at the refinery.

Changes at the refinery would be made largely to the tank house. Cost was not placed on this program. But it is estimated in the neighborhood of $2-million.

Blister from other of KCC's divisions would be shipped to Baltimore, which KCC sources say would also treat an undetermined amount of blister copper from the Braden Copper Co.

This copper is sold largely at present as fire refined in Europe. However, KCC sources say there is an increased demand for electrolytic in Europe—particularly with the big construction programs affecting public utilities such as electrical and telephone.

And it is thought that Chilean blister may someday be treated in bond at Baltimore, then shipped to European markets.

Mr. Cox stressed in his talk before stockholders that there had been a westward movement of copper fabricating.

It is expected that much of the electrolytic production from the Utah Copper Division would satisfy this area of customer demand now as far west as northern Indiana.

KCC has over the years failed to obtain an in-transit-rate on blister from various other western divisions to Utah. Thus even the "nearby" Nevada Mines Division blister cannot be treated economically at Garfield electrolytic plant.

It is expected that Kennecott will start its modernization and improvement program at the Garfield smelter shortly after taking possession. The additions to the electrolytic capacity at Garfield and Baltimore will take place between 1959 and 1965.

THIRTEEN CATS and five Allis-Chalmers HD's put their backs into the haul along the widened track from Gold Hill to Sheep Creek, north of Fairbanks, Alaska.

USSR&M Dredge Moves on 18-Tractor Power

ALASKAN DREDGE-MOVING HISTORY was made in late March when, for the first time in the Territory, a complete dredge hull was moved 7½ miles overland on a composite sled, with 18 tractors providing motive power.

The dredge weighed 680 tons.

United States Smelting, Refining & Mining Co., after working out the old Gold Hill property, moved the No. 6 to new workings at Sheep Creek. Previous moves had involved breaking down the equipment, first for its move into the Territory in 1929, when it arrived at Fox. In 1935, it was again dismantled for the trip to Ester Creek. In 1951 it was floated through a 6,000-ft artificial canal to Gold Hill. The 18 tractors consisted of 10 D8's, three D9's, three HD-20's and two HD-19's.

27 ton

"EUC" REAR-DUMP

It's new...but JOB PROVED!

325 or 335 h.p.... Torqmatic Drive ... 18.00 x 25 tires

Model R-27 is a new size in the complete line of Euclid Rear-Dumps—rated payload is 54,000 lbs. This off-highway hauler incorporates the job-proved components which have made Euclid Rear-Dumps the outstanding choice of contractors, mines and quarries.

With either 325 h.p. GM diesel or 335 Cummins engine, Allison Torqmatic Drive makes maximum use of the power for faster hauling cycles. Converter lock-up in the 4-speed Torqmatic permits 34 mph speed with full payload and efficient performance on long, high speed hauls.

Standard 18.00 x 25 tires on all four wheels assure the traction and load carrying-capacity needed for moving 27-ton payloads on tough hauls. Standard body is rated at 18 cu. yds. struck—quarry type body is also available. The R-27 is equipped with oil retarder for safer, more economical braking on jobs with steep down-grades on the loaded haul.

See your Euclid dealer for detailed specifications on this new 27-ton Rear-Dump ... it's a good example of the advanced design that makes Euclid your best equipment investment.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

A complete line of Rear-Dumps—10, 15, 18, 22, 27, 40 and 50 ton capacities, also semi-trailer models of 12, 22 and 35 ton payload—to fit any job.

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

Do you get service like this?

USS Rolled Plate Lining mills 1,000,000 tons of gold-bearing ore before being replaced

HOMESTAKE MINING COMPANY, Lead, South Dakota, grinds gold-bearing quartz, two-thirds of the ore being of unusually hard rock. The ball mill produces a grind to pass 65% through 200 mesh.

Recently, the #2 unit in the ball mill was relined and performance of the previous 26-month-old USS Rolled Plate Lining was evaluated. The heavy lining consisted of 24 tons of 3″ plate and 5″ lift bars. It was in operation 773.75 days and milled 1,051,034 tons of ore, an average of 1,358 tons per operating day.

Because USS Rolled Plate Linings are made of *rolled* steel, they have superior toughness. Lift bars are rolled alloy steel and heat treated to obtain extra hardness and toughness through the lift portion of the lining. Both plates and bars are made to close tolerances for snug fit.

Our technical personnel will be glad to advise on any tough grinding problem.

Original lift was 2¼″. Lift remaining at replacement measures a full 2″. Liner plates are worn to less than ¼″ in the valleys. There was no evidence of breakage in either plates or bars.

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Export Company

USS TRADEMARK **United States Steel**

Minnesota *(Continued)*

the first plant in the area to start the 1958 season. Other plants are not scheduled to begin until May. About 80 men were called back to work.

Erie Mining Co.'s big power plant at Taconite Harbor on Lake Superior has been completed and is now in operation. It has a rated capacity of 150,000 kilowatts. Two big turbo-generators produce 13,800 v, stepped up to 138,000 v for transmission to the plant at Hoyt Lakes, 61 miles away, where it is reduced to the original voltage. More than 545 miles of cable, supported by 314 steel towers are required for the line.

Jones & Laughlin Steel Corp. has concluded its winter stripping program which included the Hill-Annex at Calumet, the Longyear at Hibbing and the Pettit and Schley mines at Gilbert. Pettit and Schley were opened up as underground operations by Republic Iron & Steel Co. in 1902 and 1910 respectively. Hill-Annex has shipped more than 51-million tons since its opening in 1917.

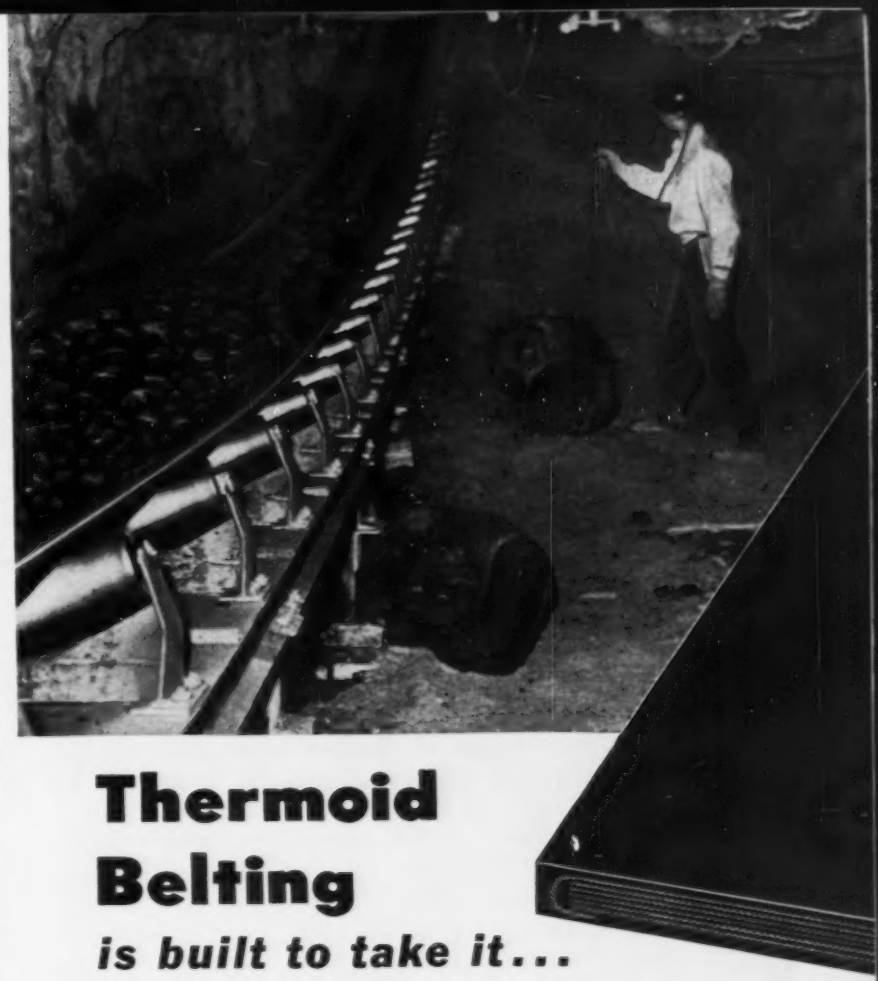
W. A. Sterling, president, Cleveland-Cliffs Iron Co., says that the company expects to operate only 10 of its 16 Great Lakes ore vessels this year. Some of them may not get under way before late May or early June. Most Great Lakes ore fleets are starting four to five weeks later than last year.

The 34th annual meeting of the Lake Superior Mines Safety Council was held in Duluth on May 22 and 23d. A. J. Stromquist, director of safety for the Cleveland-Cliffs Iron Co., Negaunee, Mich., is president of the Council. Among the interesting papers presented were: "Management's Viewpoint of Safety", by W. A. Sterling, Cleveland, president of Cleveland-Cliffs Iron Co.; "Off the Job Safety", by D. E. Mumford, New York, director of safety, New York Central R.R.; "If You Don't Like It Here in America" by Dr. Schoendeust, metallurgist, Goetz, Ecole Industriale, Duchy of Luxembourg; "High Voltage Demonstration" by T. A. Findley, safety director, Minnesota Electric Cooperative, St. Paul; "Safety Blasting Practices", Richard Sherman, Du Pont Co., Iron Mountain, Mich. and "Effective Communications in Safety", G. B. Strothers, Associate Professor of Commerce, University of Wisconsin, Madison.

NEVADA

Ed Bottomley, Lovelock mining engineer, has been given permission to prospect 15 patented mining claims owned by Pershing county in the Seven Troughs district. Long one of Nevada's big gold and silver producing areas, the Seven Troughs district is believed to contain many other as yet undiscovered ore deposits, and Bottomley plans to carry on extensive exploratory work this spring and summer.

All mining operations of Eureka Corp. Ltd. in the Eureka District ceased early



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is built to take it...

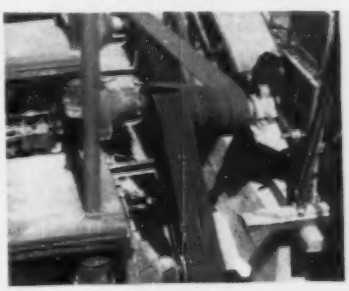
underground!

This is especially true of fire-resistant Thermocoal—the belt that bears acceptance designation #28-13 of the U. S. Bureau of Mines.

You'll not only have a belt that meets or exceeds all after-flame and after-glow tests . . . you'll also benefit from typical Thermoid toughness. Thermocoal Belts are engineered for high resistance to flexing and impact, edge wear, abrasion and mildew. You can specify either 4 or 6 ply construction of the strongest cotton or cotton-nylon duck—impregnated with specially compounded Thermoid rubber stocks to assure longer life, lower costs.

Your Thermoid Distributor can help you select the belting that meets your requirements. Contact him . . . or write direct for detailed information and data sheets.

Make Thermoid your choice, too, for Multi-V Belts . . .



. . . and Hose manufactured with your needs in mind.

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Thermoid Company
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Nephi, Utah

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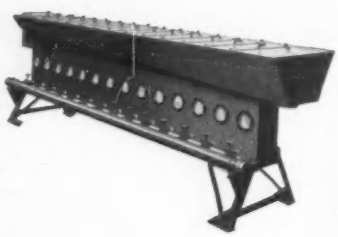
The concentration of minerals is at its best on the SuperDuty® DIAGONAL-DECK® table. Engineers generally attribute its efficiency to the shaping of the deck so that it conforms to the natural flow of the pulp across the riffled deck, thus eliminating "loafer" areas while putting 75% more effective riffles to work.

The fact is however, that although the deck shape is most significant, the high efficiency of the SuperDuty table is possible only because all tabling factors—including head motion and underconstruction—are carefully coordinated for smooth, effective action. You get maximum recovery, highest grade concentrates and minimum loss to the tailings. For full information, send for Bulletin 118-B



CONCENCO®
Type "CPC" Classifier

This all steel Constriction Plate Classifier is available in 1 to 10 or more cells. Novel secondary classification sharpens the separations made by each main cell. Advantages offered are: (1) accurate classification or sharp sizing, (2) easy and effective hydraulic water regulation, (3) as many spigot products as there are cells, (4) continuous discharge, (5) no moving parts, (6) low maintenance cost.

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CONCENCO PRODUCTS

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Nevada *(Continued)*

in April and 15 miners were laid off. Pumps were pulled and the lower workings were allowed to flood. The shutdown was attributed to prevailing low prices for lead and zinc. The complex nature of the ore also had some bearing on the decision to shut down operations.

Rebuilding work on the Round Mountain Gold Dredging Co. dredge at Round Mountain was completed during the third week in April, and operation of the big machine was started. President Rose, Fresnillo Co., parent firm of the Nye County operating company, was on hand from his headquarters in Mexico to watch the first turning of the wheels.

Standard Slag Co., which is currently employing 55 people at its Gabbs magnesite plant and 40 men at the Minnesota Iron Mine near Yerington, faces cutbacks in employment and production this year, according to Robert O. Jones, manager of the firm's Western Division. He says some curtailment at the Gabbs site will be necessary by mid-year unless steel production rates improve substantially. At the Minnesota Mine, where shipments of iron ore have averaged 25,000 long tons per month for the last year, loss of the Japanese markets may force a shutdown. All the mine's output has been going to Japan.

On April 15 the first gold and silver bullion ingots from the United States Milling and Minerals Corp. mill at Silver Peak were poured while a number of company, county and state officers looked on. Samuel Levine, head of the company, presided at the ceremony held at the Esmeralda County site, and A. W. Rischmiller company engineer announced that the first pouring contained 6,720 oz Ag and 35 oz Au, a total value of $7,273.

All operations have ceased at the Wah Chang Co.'s Tempiute Mine in Lincoln County, and plans are in progress to move the mill from the Tempiute site to a new mining location, probably in southern or central Nye County, where it will be used to process nonmetallics.

NEW MEXICO

Following dedication of the Homestake-New Mexico Partners' uranium processing mill at Grants, Alva A. Simpson, Jr., president, United Western Minerals announced that in addition to the ore from Sec. 32, T-14N, R-9W, ore from Sec. 14,T-13N, R-9W, and ore from Sec. 8,T-13N, R-9W, had also been dedicated to the new mill. The orebody on Section 8 was purchased by United Western at the time it acquired all of the assets of Colamer Corp. in 1957.

Simpson said that a uranium orebody drilled out by Four Corners Exploration Co. on property owned jointly by United Western Minerals and the Farmout Group (composed of J. H. Whitney & Co., White, Weld & Co., and San Jacinto Petroleum Corp.) has been dedicated to the Homestake-New Mexico Partners.

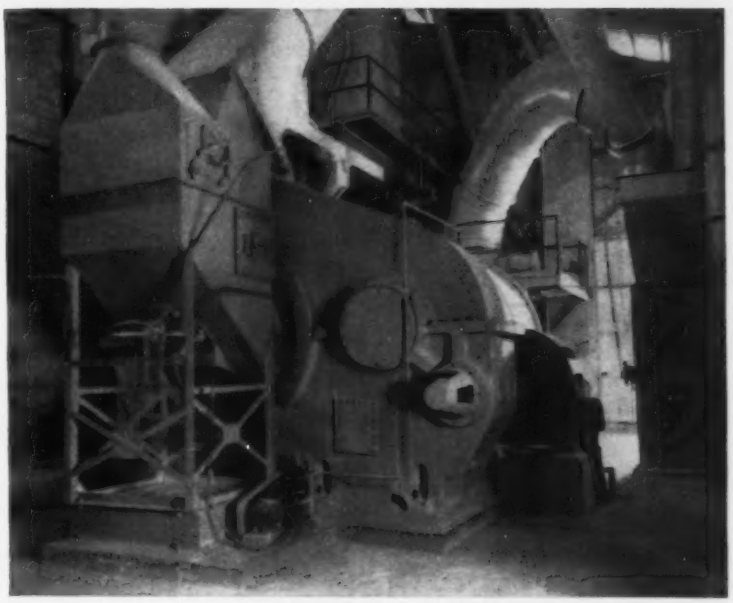
LOWER

production costs with a

KENNEDY

air swept grinding system

The KENNEDY Air Swept Tube Mill Grinding System is the ultimate in high production and low operating cost. The experience of the many owners of KENNEDY Mills has shown that the cost of this mill can be paid in a few years with the savings in maintenance and power alone!



KENNEDY 10′ x 15′ Integral Gear Drive Air Swept Ball Tube Mill and #93 Exhauster Fan in service at the American Agricultural Chemical Co., Pierce, Florida.

HERE ARE A FEW OF THE REASONS FOR THE ECONOMY AND POPULARITY OF KENNEDY PULVERIZING SYSTEMS...

REDUCED MAINTENANCE • Tramp iron and other foreign material cannot damage the system. Years of operation are assured before parts (except for grinding balls) require replacement.

CONTINUITY OF OPERATION • Lubrication and replacement of grinding media is accomplished without shutdown or interruption of production.

MINIMUM POWER • Careful design and construction and a proven pressure lubrication system insure a high mechanical efficiency.

HIGHER PRODUCTION • Single grinding units are built for capacities to 100 tons per hour. Production and fineness remain constant, month after month.

LOWER OPERATING COSTS • Dependability of equipment and reliable automatic feed control assure high production with minimum manpower.

CAPITAL SAVINGS • No magnetic separators are required. KENNEDY units require less structural steel and floor space per ton of product.

FLEXIBILITY OF DESIGN • KVS Air Swept Grinding Systems are available for a wide range of capacities and products.

Send now for full details on KENNEDY Size Reduction Equipment.

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NOW, A MANGANESE STEEL ELECTRODE
with High Build-up, Low-spatter, Easy Slag Removal

A special new Amsco rod, Nicro-Mang, for both joining and buildup of manganese steel

Out of Amsco® metallurgical research has come a new welding rod that gives you high weld strength without cracking on Austenitic manganese steel. A rod that lets you lay down a bead without slag popping, and slag removal is easy.

To lick the cracking problem, it took a special alloy of chromium and nickel, plus a unique coating for Nicro-Mang.

Write for Nicro-Mang bulletin, or see your local Amsco distributor.

Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Illinois

New Mexico (*Continued*)

The orebody is reputed to be of an exceptionally high grade. Approximately 150,000 tons of high grade ore have been drilled, with a possible additional 150,000 tons of inferred ore indicated.

This section is adjacent to the Calumet & Hecla orebody. Homestake will operate the property, sharing in the mining and milling profit. United Western will have a 37½% net mining and milling interest. It is estimated the section will be in production by August.

NORTH CAROLINA

North Carolina State Board of Conservation and Development approved plans to establish a laboratory to supplement field work by members of the C&D Department's mineral resources division.

It also voted to ask the attorney general to advise on the status of a lease granted by the board several months ago giving J. E. Fitzpatrick of Ft. Worth, Tex., the right to explore for oil, gas and sulphur on state-owned lands in eastern North Carolina. The question of the status of the lease arose when the board learned that Fitzpatrick now is dead.

NEW YORK

The largest commercial contract ever made for fabricated beryllium metal has been awarded by the Centre d'Etude de l'Energie Nucleaire (CEN) of Belgium to the Brush Beryllium Co., Cleveland.

Nuclear Development Corp. of America, White Plains, which designed the nuclear reactor that will use the beryllium, is acting as agent for CEN in specifying the components of the reactor from American firms and is selecting the manufacturers.

The $1.2-million contract calls for Brush to fabricate two core matrices for Belgian Reactor-2, a high flux materials and engineering test reactor now under construction at Mol, Belgium for CEN.

NORTH-SOUTH DAKOTA

The lifting of an Atomic Energy Commission ban on buying uranium ore may lift the curtain for a new multi-million-dollar industry in North Dakota and South Dakota.

The uranium deposits are contained in the lignite fields of Harding and Perkins counties, S.D., and near Bowman, N. D.

The uraniferous lignites have no market at present since they can't be processed in any mill currently operating or under construction.

International Resources Co. has submitted a proposal to the AEC offering concentrate at a competitive price.

Officials estimate there are about 1,500,000 tons of the uraniferous lignite in the two-state area. The proposed mill would have a capacity to process 600 tpd, giving the area a known supply of about 10 years.

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The Wemco S-H Classifier:

Proved – World Standard of Profitable Production

Wemco engineering makes the difference where classifiers must give continuing, top production — at low cost.

The distinction: Wemco exclusive features — 75% pitch design for maximum capacity potential through the use of triple pitch helixes, large shaft size and construction, hydraulic lifting device. Wemco S-H Classifiers are *standard* — industry-wide and world-wide.

Depend on the Wemco S-H Classifier and the skills behind it

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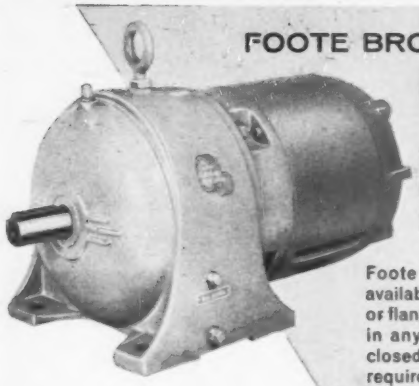
FOOTE BROS. **Motorized Drives**

Duti-Rated LIFETIME GEARING

Gives You More Power Per Dollar



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GEARMOTORS

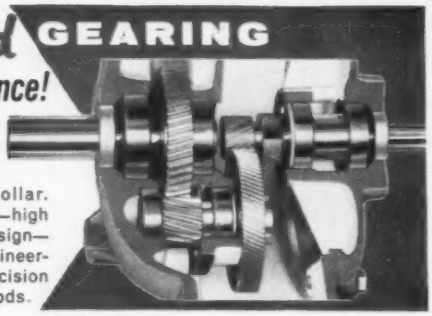
1 to 150 HP...Single, Double, Triple, Quadruple Reductions . . . Output Speeds from 780 to 7.5 RPM

Foote Bros.-Louis Allis Gearmotors are available in over 3500 types and sizes. Foot or flange mountings. Motors can be ordered in any type—open drip-proof, totally enclosed, explosion proof, etc. to meet your requirements.

Duti-Rated GEARING

Makes the Difference!

Duti-Rated Gearing is the heart of Foote Bros. Motorized Drives . . . drives that give you more load capacity and wear life per dollar. This is premium quality gearing—high hardness, accurate, balanced design—the product of thousands of engineering and development hours, precision tooling and manufacturing methods.



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Line-O-Motor

1 to 75 HP...Double, Triple Reductions...

Ratios: 5:1 thru 238:1

Line-O-Motor Drives accept any NEMA frame motor . . . permit you to use your own motor or specify type to meet plant standardization. Foot or flange mounted.

Write for CATALOG MRA. It has complete details and selection data on Foote Bros. Motorized Drives.

this trademark stands for the finest industrial gearing made

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Better Power Transmission Through Better Gears

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Dakotas *(Continued)*

It is further estimated that the raw product would bring the miner about $16 per ton plus a transportation fee. The transportation would bring up to an additional $6 per ton if the lignite were brought 100 miles or more.

The AEC, in its report on the area, said the ore reserves have a grade of about .20% uranium, which would mean about four pounds of uranium could be extracted from each ton of the lignite.

No definite location has been selected for the proposed mill but it is expected to be within one of the three counties involved.

Sen. Francis Case (R-SD), who has followed the developments closely, called the latest action "one of the most important things to happen for South Dakota in some years". Case sponsored legislation back in 1955 to permit uranium mining in the lignite coal fields. Such legislation was necessary since the lignite had been set aside by the government as coal reserves.

The measure authorized the filing of mining claims on uranium ore discovered in lignite deposits and opened the deposits to mining as soon as a practical process of extraction was developed.

OREGON

Grading and leveling of the site for Lakeview Mining Co.'s $2.6-million uranium mill has started under a contract held by the Lakeview Logging Co. Plans for the mill have been prepared by Galigher Co., Salt Lake City, and are now out for bids. Construction of an office and change room at the mill site is underway.

California-Oregon Power Co. is constructing a 66,000v line 10¾ miles from Lakeview to the White King mine on Augur Creek. Lakeview Mining has been generating its own power at the mine site.

Mining has reached the 312-ft depth at the mine. Work was started late in April on an excavation for drifts and tunnels at the 250 ft level. Other levels have been established at 70 and 160 ft.

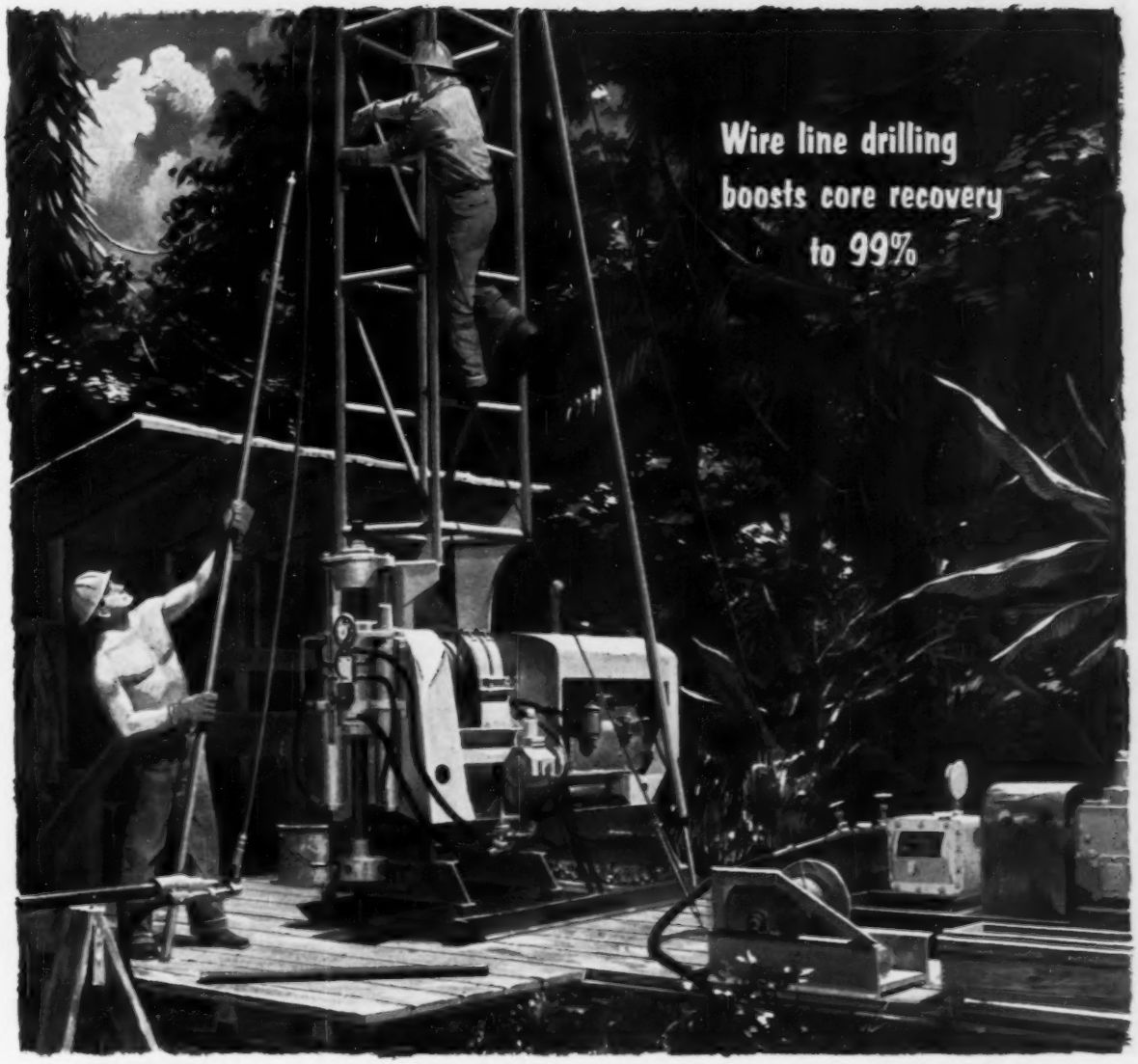
Horseheaven Mine, which has produced about 17,000 flasks of quicksilver since 1934, was shut down in April. The mine, located in eastern Jefferson county, was operated by Cordero Mining Co.

Bill Traver, Davenport, Wash, and Henry and Harold Franz, Ritzville, Wash., have leased the old Bay Horse silver mine on the Snake River below Huntington. They are reconditioning the old workings and have made some new surface cuts for preliminary appraisal purposes.

PENNSYLVANIA

Foote Mineral Co. recently purchased a 54-acre tract at Exton, where a commercial transistor-grade silicon metal facility will be erected. At the company annual meeting, held in Philadelphia, president

(Pennsylvania continues on page 152)



31' Per Shift through Broken Limestone and Chert

During a recent exploration, the first 95 feet of one hole were drilled with conventional BX and NX tools. Core recovery was a low 35%. At 95 feet the driller switched to Longyear BX Wire Line. Core recovery for the remaining 1340 feet of the hole was 99%. In fact, in 733,000 feet of Wire Line Drilling in 21 states, core recovery has averaged 94.5%.

In ground that blocks frequently, drillers using conventional equipment are reluctant to pull hundreds or thousands of feet of rods for every 2 or 3 feet of core. Instead, they often drill through the blocks.

In contrast, drillers using Longyear Wire Line can recover the blocked core easily, and will do as often as necessary. Thus, with Wire Line, drillers obtain maximum core recovery while the drill rods remain in the hole acting as casing. In fact, drilling often progresses for hundreds of feet before it is necessary to pull rods to replace the bit.

To learn how Longyear Wire Line Drilling, functioning as part of Longyear *Coordinated Systems*, can save you time and money, write for *Longyear World #4* today, E. J. Longyear Company, Minneapolis 2, Minnesota.

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THE WORLD IS OUR WORKSHOP

(*Pennsylvania continues on page 152*)

James Barber, N.M. Grants "Beacon"

PLANT AND OFFICES spread out beside NM highway 53 near Ambrosia Lake. Amenable custom ores will be accepted.

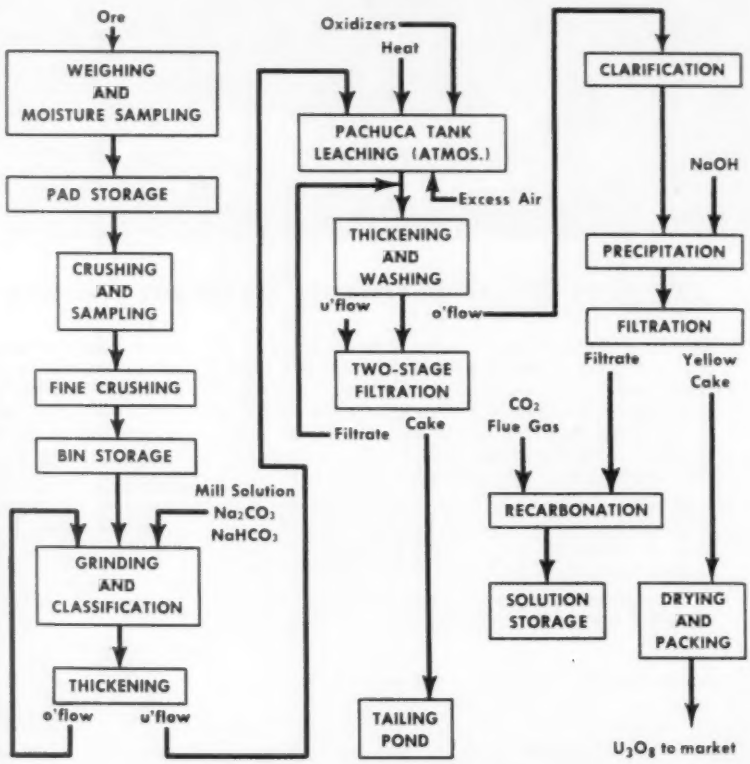
Homestake-New Mexico Starts Milling

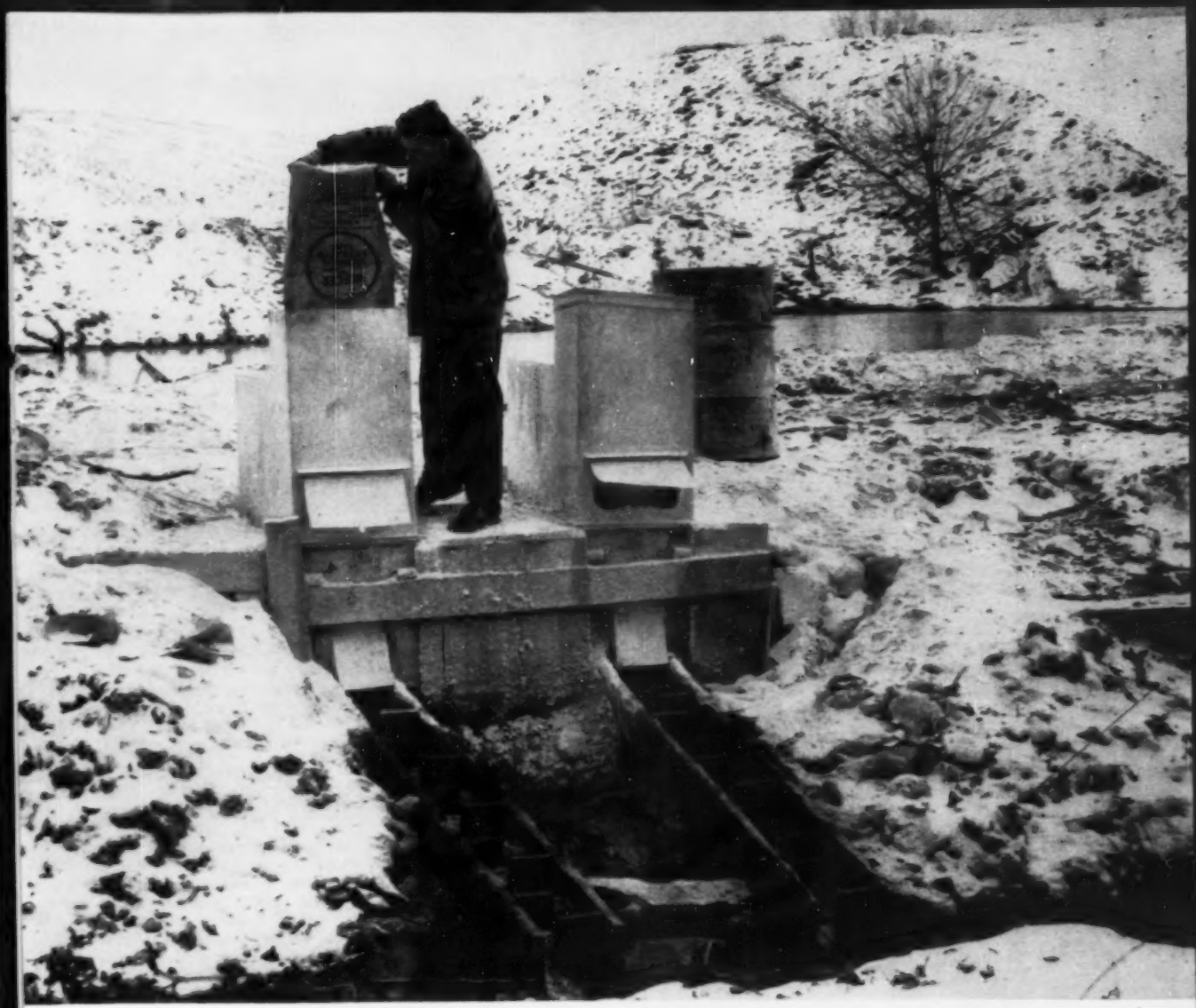
THE NEW Homestake-New Mexico Partners 750-tpd uranium mill commenced operation Feb. 3 on Dysart mine ore stockpiled at the plant site during the construction period. The first yellow cake was barreled on March 5. Crushing, storage, and processing plants are situated on the south half of Section 26, T 12 N, R 10 W along the west side of New Mexico Highway 53 leading to the Ambrosia Lake Mining area. These are designed to process ores from the Dysart mine of Rio De Oro Uranium Mines, Inc., and mine 32 of H-NMP, both in the Ambrosia Lake area some 24 miles distant. The Dysart mine is currently producing about 700 tpd assaying 0.25% U_3O_8. Mine 32 is rapidly nearing the production stage. Custom ores will be accepted at the new mill if amenable to the process employed—namely, carbonate leaching followed by caustic precipitation to produce a specification grade yellow cake.

Mill operations include grinding with solution crushed and sampled ore to 65 mesh in a ball mill-classifier circuit; thickening of classifier overflow to 50% solids; leaching thickened pulp in hot (180 deg F) solutions with excess air for 36 hr in Pachuca tanks; dilution and washing of leached pulp in one stage of thickening; thickened pulp (50% solids) filtration and washing on drum type vacuum filters; second stage drum type filtering to further wash pulp; pumping washed solids to tailings; clarifying pregnant solution; yellow cake precipitation from pregnant solution with an excess of caustic soda; yellow precipitate filtration in pressure filters; yellow cake drying and packing in drums for shipment; barren solution recarbonation in cypress packed towers using boiler house flue gases as source of CO_2; and return of recarbonated solution to leach circuit or mill solution storage.

FIRST YELLOW CAKE is weighed by division manager L. W. Swent, Howard Jackson of Western-Knapp, and C. E. Osborn, manager of the H-NMP mill.

HOMESTAKE-NEW MEXICO PARTNERS
GRANTS, N. M.





The "Autolimer" is made by the Shirley Machine Company, 725 Liberty Avenue, Pittsburgh 22, Pa.

New neutralizer for mine water constructed of USS Stainless Steel

Lime and acidic mine water are mixed in the stomach of the "Autolimer." Powered only by the water that flows through it, this machine dumps measured amounts of lime into the drain water to neutralize it and prevent pollution of streams.

A constant diet of lime and acid would quickly eat away most materials. That's why the major parts of the "Autolimer" are made from Stainless Steel. Stainless resists corrosion, it's hard and abrasion resistant—therefore it gives long service in the toughest mine jobs.

If corrosion and wear have damaged equipment at your mine, replace it with Stainless Steel. It cuts maintenance and it often eliminates replacements completely. Write to us for full information about Stainless Steel equipment for mine work. United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

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United States Steel Supply—Warehouse Distributors
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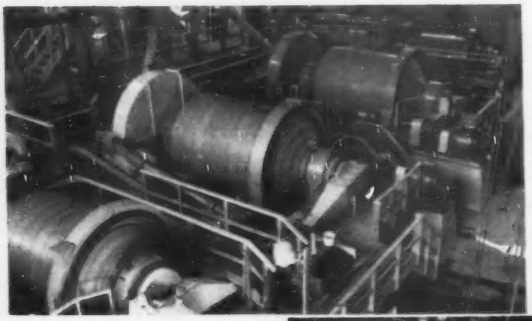
USS United States Steel

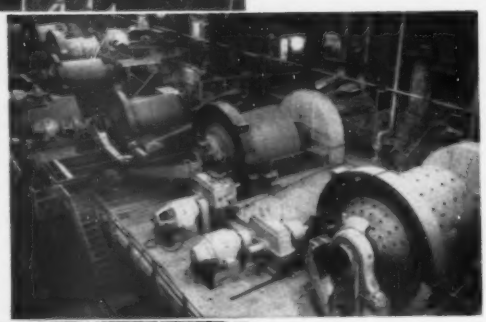
TRADEMARK

On URANIUM, it's Hardinge...

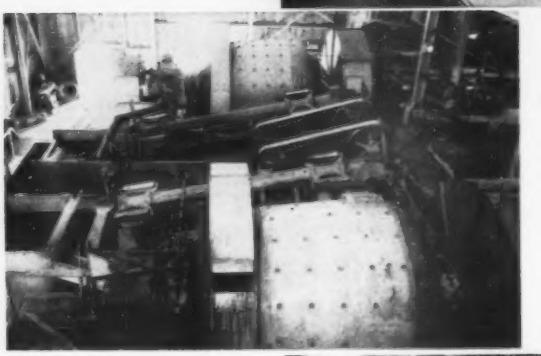
- *ROD MILLS*
- *TRICONE MILLS*
- *AUTOGENOUS GRINDING PEBBLE MILLS*



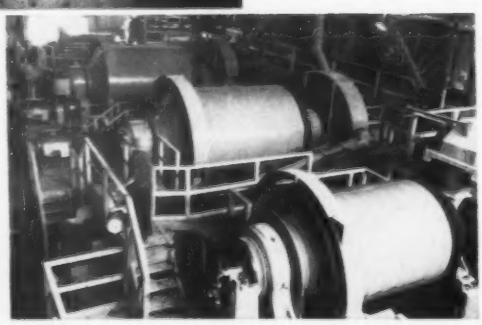
Hardinge 6'x8' Rod Mills followed by Hardinge 9'x11' Autogenous Pebble Mills in closed circuit with classifiers. Application: Uranium Ore.



Four 7'x10' Hardinge Rod Mills, four Hardinge 10½'x10'x9' Tricone Ball Mills. Application: Uranium Ore.



Two Hardinge 11'x3'x6'x10' Tricone Ball Mills. Application: Uranium Ore.



Twin installation to first shown above but on another property: Two Hardinge Rod Mills and two Autogenous Grinding Pebble Mills using sized rock as grinding media. Application: Uranium Ore.

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Pennsylvania *(Continued)*

L. G. Bliss stated that Foote is now recovering by-product mica from Kings Mountain, N. C. lithium ore.

TEXAS

U. S. Bureau of Mines established a field office in Giddings, Texas and started exploratory drilling on zircon-ilmenite sand deposits about 15 miles northeast of Giddings near the Lee-Burleson County line. Heavy sands occur in the Wellborn formation of the Jackson group (Eocene). Deposits are characterized by weak radiation anomalies in an area of otherwise low background.

UTAH

Delhi-Taylor Oil Corp. reports continued progress toward construction start on a $20-million potash mine and surface plant in the Cane Creek area of Grand County.

Silver Reef mill of Western Gold and Uranium, Inc. is now treating 300 tons of silver-copper ore per day. Forty tons daily are produced from the Big Hill mine which was developed in 1955, and 260 tons from dumps and tailings.

WASHINGTON

Dawn Mining Co., a subsidiary of Newmont Mining Corp., announced that it was lowering the minimum shipping requirement for custom shippers to its Ford, uranium processing plant.

Jack Crowhurst, manager of the plant, said that 350 ton ore shipments will now be accepted. The minimum formerly was 500 tons. He said that currently, the company was treating the ore of two custom shippers. These are Daybreak Uranium, Inc., Spokane, and Kendrick Bay Mining Co. of Alaska.

Dawn also announced that it had resumed operations at its Midnite mine on the Spokane Indian reservation. Road conditions in the area had halted mining operations in January.

Officials of the Northwest Magnesite Co.'s plant at Chewelah, said the plant was to reopen late in April. The plant had been shut down earlier in the year because of a slowing in the demand for magnesite in eastern markets. Howard Ziebell, general manager of the Chewelah plant, said there was a slight upturn in demand recently.

Washington State Institute of Technology at Washington State college at Pullman, is currently experimenting with methods of upgrading the sub-marginal uranium ores of the Spokane area, according to William C. Aitkenhead, director of the institute's mining experiment station. He said the experiments so far have given indications of success. Work covers both leaching and froth flotation of secondary-type uranium ores.

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IN CANADA

ONTARIO

Marmoraton Mining Co., subsidiary of Bethlehem Steel Corp., is producing at top capacity from its open pit iron deposit near Marmora. Production is running presently at 500,000 tons of iron pellets per year. The ore averages about 35% magnetite with the final product grading about 65% Fe. It is anticipated that open pit reserves are sufficient for operation at current rate for 18-20 years.

Canadian Dyno Mines is the newest uranium producer in the Bancroft area. It is the fourth mine in that area to come into production. First uranium precipitates came off the mill circuit early in May. The mill was brought in initially at 550 to 600 tpd, and is being worked up to its full capacity of 1,000 tpd. The company has a contract with Eldorado Mining & Refining for delivery of $34,816,070 worth of uranium precipitates by March 31, 1963.

National Steel Corp.'s Lowphos Ore, Ltd., at Moose Mountain, is nearing completion of its concentration plant with a capacity of 550,000 tons of concentrates per year. The property will not be operated until the demand for iron ore increases.

Wright-Hargreaves Mines, veteran gold producer in the Kirkland Lake area, has reported ore reserve estimates this year for the first time. At Dec. 31, 1957, these stood at 517,092 tons averaging 0.39 oz gold per ton. Including drill indicated ore at deeper horizons, it is estimated that there is sufficient ore for about five years at daily milling rate of 460 tons.

Cochenour Willams Gold Mines, which celebrates its 20th birthday this year, is preparing for new depth development at its gold producer in the Red Lake area. The company has completed a major shaft sinking operation which resulted in deepening the shaft an additional 1,000 ft to a depth of 2175 ft. Deepest workings are still only down to depth of 1100 ft.

International Ranwick is preparing for production of molybdenite and copper concentrates at the Min-Ore Mines property in the Matachewan area. Stope preparation, drifting and raising, revamping the mill and research on concentration methods are being carried out.

Fatima Mining Corp. has started work on its Timmins area nickel prospect. A geochemical survey is planned to test a large area along a favorable nickel bearing zone.

Milliken Lake Uranium Mines Ltd. became a producer of uranium oxide late in April. Company president W. H. Bouck commended mine personnel for their work in bringing the property to the stage of production.

First ore was fed into the crusher March 11, 1958, and the mill is now expected to be operating at scheduled capacity of 3,000 tpd by mid-summer.

QUEBEC

Thousands of claims are being snapped up in the Kipawa area, some 60 miles northeast of North Bay near the Ontario border. Last fall, high-grade uranium discoveries were reported from the area and recently gold has been found associated with the uranium. The finds are located in narrow bands of quartzite which forms a north-south basin structure about 12 miles in diameter. The original discovery is currently being tested by Belleterre Quebec Mines. Major companies which have moved into the area include McIntyre Porcupine, Prospectors Airways, Noranda Mines, and Kerr-Addison Gold Mines.

Mill rate at Merrill Island Mining Corp., copper producer in the Chibougamau area, is at capacity rate of 670 to 680 tpd. This is above the officially rated capacity of 650 tpd. Mill feed has been drawn principally from surface stockpile but is now starting to move from underground stopes. Ore reserves have been estimated at about 1.2-million tons grading 2.2% Cu.

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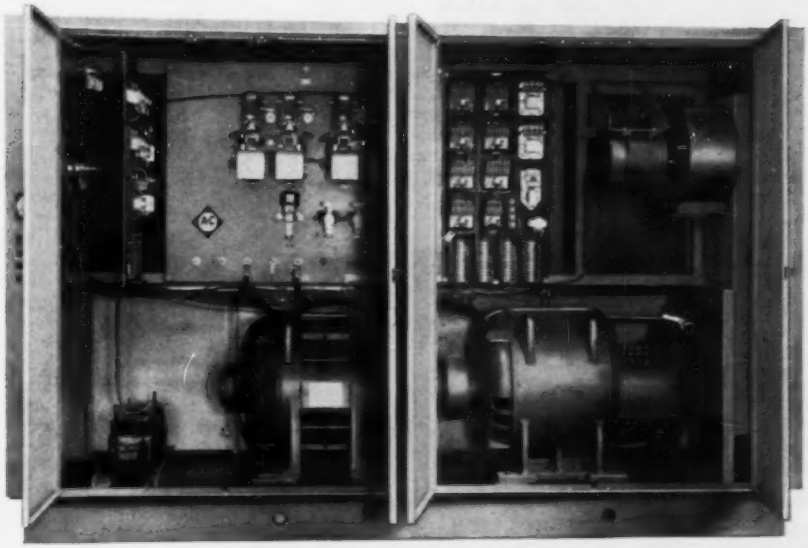

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Quebec (*Continued*)

Indicated ore reserves at the lithium-producing property of Quebec Lithium Corp. in the LaCorne area are now estimated at more than 20-million tons grading 1.15% Li_2O. Output in 1957 totalled 257,013 units of Li_2O from treatment of 226,873 tons. In the previous year 238,309 tons were milled for output of 239,392 units.

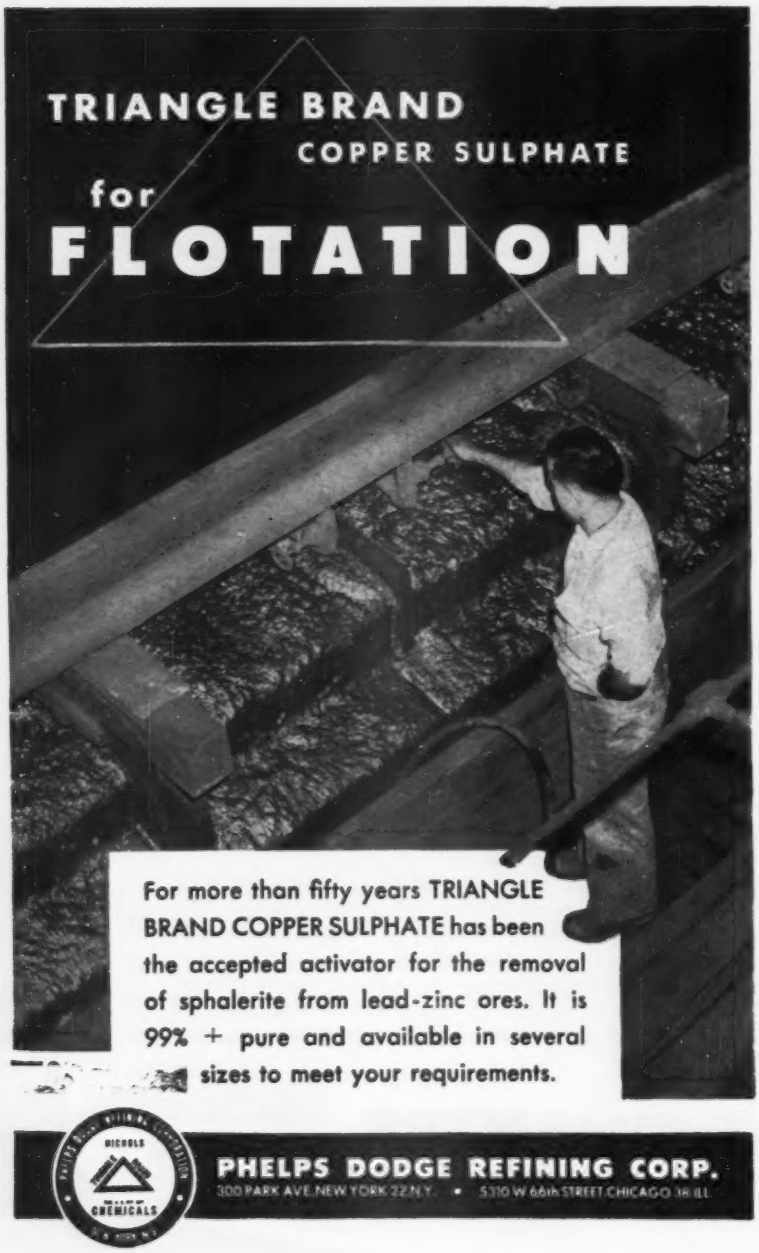
Hull Iron Mines is driving an 835-ft inclined tunnel in preparation for testing a drill indicated magnetite deposit at its property five miles from Hull. Examination of old mine workings is also under way. Metallurgical tests are to be run on material to be taken from these workings. Diamond drilling has indicated about 1.5-million tons. Grade is placed at 46% Fe.

MANITOBA

Sherritt Gordon Mines has announced the purchase of all the concentrates produced by Rankin Nickel Mines up to and including September of this year. Shipments from Rankin Inlet on the west shore of Hudson Bay are expected to begin in August. Between 4- and 4.5-million lb of contained nickel are involved.

Sherritt Gordon reports operations for the first quarter of 1958 continued normal. Net profits amounted to $878,363. Installation of facilities to raise milling capacity to 3,500 tpd is under way at Lynn Lake. This will enable the company to treat lower grade ore while maintaining its metal output.

Hudson Bay Mining & Smelting reports net profits in the first quarter of 1958 were equivalent to 49c per share. At the company's two new mines at Stall Lake and Chisel Lake, shaft sinking is continuing.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SASKATCHEWAN

Uranium mining and production is expected to be slightly higher than in 1957, which was a record year for the Province. Expansion of milling capacity in the Beaverlodge area is virtually complete and has resulted in three uranium processing mills turning out 4,300 tpd of treated ore. Deliveries from the Saskatchewan mills are scheduled to reach $300-million under contract by 1963.

Eldorado Mining & Refining Ltd. is up to production capacity of 2,000 tpd and Gunnar Mines Ltd. open pit uranium operation has reached 1,650 tpd. Lorado Uranium Mines, doing custom work for other companies as well as treatment of its own ore, expected to move up to 750 tpd by June. The company handles ore from Cayzor Athabaska Uranium Mines, Lake Cinch Mines, and National Explorations Ltd., and has contracts also with Black Bay Uranium Ltd. (temporarily shut down) and St. Michael's Uranium Ltd.

Recently, Hudson's Bay Mining & Smelting Co. has been stepping up development work on the Saskatchewan side of its extensive Flin Flon mining properties. More than half the production for the Flin Flon smelter is now coming from Saskatchewan properties and shipments have already started from the Birch Lake mine immediately south of Amisk Lake. Another Saskatchewan property, the Coronation mine, is being actively developed.

Also in the La Ronge area, Ventures Ltd. is reported conducting a ground electromagnetic survey on 40 claims at English Bay. Fort Reliance Minerals has recently completed line cutting on a group of claims at Alsmith Lake 55 miles east of La Ronge, and an electromagnetic survey is under way. Prospector Airways, working on a group of claims taken out in the Oskikebuk River area last fall, has completed drilling 2400 ft in seven holes.

This drilling was done through lake ice and the conductors will be ground checked after the ice breakup. Regal Mines Ltd. has started an exploratory diamond drilling program at Sucker Lake north of La Ronge, and Canadian Nickel Co., an exploration subsidiary of Inco, has been engaged in exploratory work on 36 claims 50 miles north and east of La Ronge.

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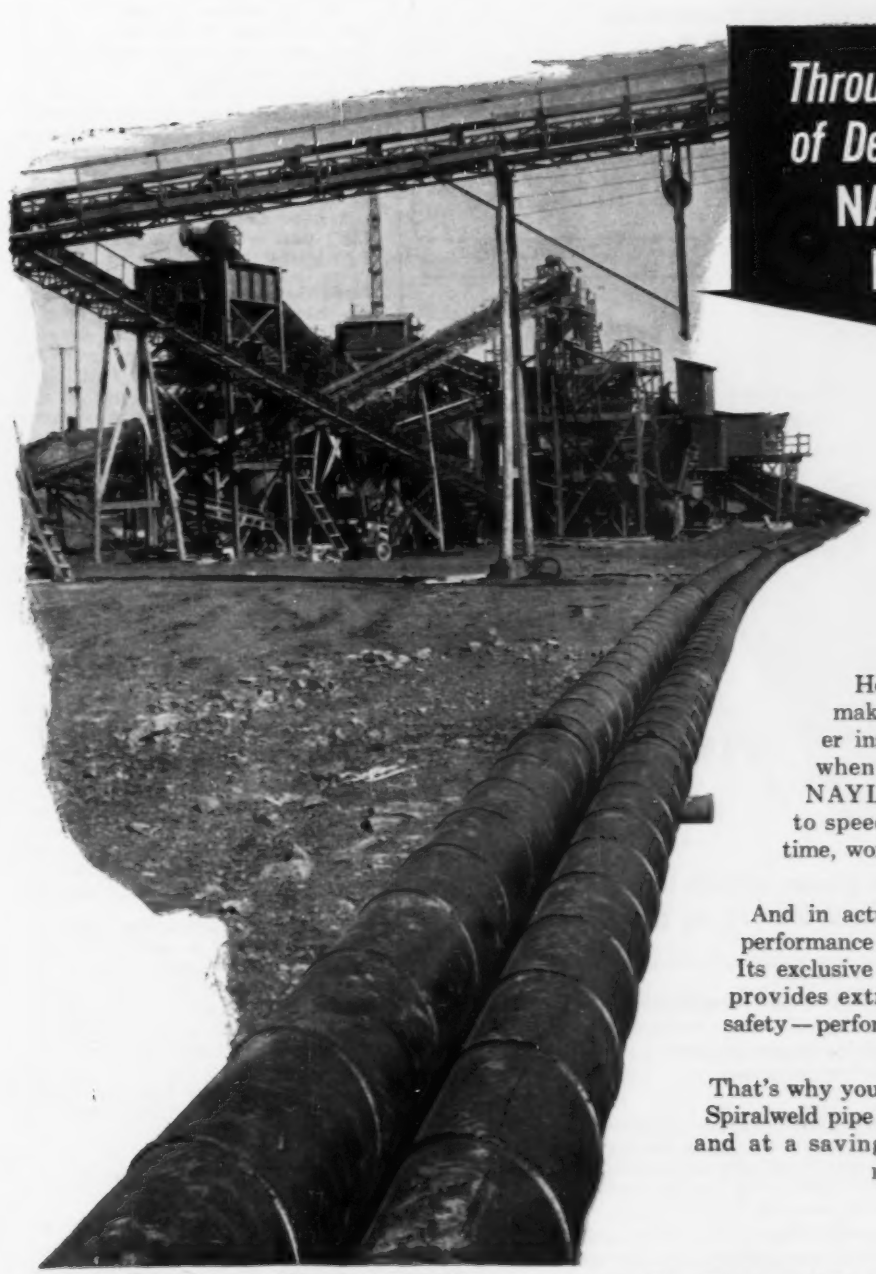

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Saskatchewan (*Continued*)

Development in the areas is expected to receive a boost from the road program, easily the largest yet projected for the chalcopyrite mining country of northern Saskatchewan.

The $15-million program, to extend over five years, is intended to provide road access into known mineral areas. One road will lead from Prince Albert eastward toward Flin Flon, opening up the southern fringe of the Canadian Shield where established deposits of gold, silver and zinc exist, especially in the vicinity of Deschambeault and Hansen lakes. The second road will run northeast from La Ronge toward Reindeer Lake, then swing northwest to Uranium City in the Beaverlodge area.

Production start for Saskatchewan's potash industry is scheduled for later in the year by the Potash Co. of America. The company expected to reach the 3,000-ft pay zone level in June. Early difficulties in shaft sinking through soft material were overcome by surrounding the concrete shaft wall with refrigerated pipe, and progress recently has been through stable rock. The property is 17 miles east of the city of Saskatoon, and total investment is scheduled at $20-million.

The second major operator, International Minerals and Chemical, is expected to come into production next year or in 1960 on a property at Esterhazy 150 miles east of Regina. The company's investment will reach $18-million, states President Louis Ware, with a production rate of 3,500 tpd slated for markets in the northern tier of the U.S.

In all, 14 companies are active in potash through a broad belt extending southeast to northwest across the Province. Latest entry is a West German firm, Winsal of Canada, which has two parcels of potash subsurface withdrawals in the Melville and Yorkton districts.

The Provincial government has announced plans for a second magnetometer and electromagnetic survey of the kind which brought hundreds of prospectors into the La Ronge chalcopyrite area last fall. This spring and summer the surveys will be in the Reindeer Lake region northeast of La Ronge and in a region adjacent to the 1,700-square-mile area near La Ronge already surveyed.

BRITISH COLUMBIA

A discovery of germanium has been reported in the Powell River area about 80 miles north of Vancouver. Taiga Mines Ltd., a B.C. company incorporated two years ago to engage in copper mining on Vancouver Island, has staked some 100 claims. The germanium occurs as fossils in the sandstone and slates of the walls bordering Lang and Kelly Creeks.

Highland Valley Mining Corp. Ltd. has announced a preliminary agreement has been signed on a working option with Noranda Explorations Ltd., on the

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Bemis

B. C. *(Continued)*

southerly 47 claims of Highland Valley's 126-claim property near Craigmont Mines Ltd. in the Merritt-Nicola area. Noranda would put $450,000 into development.

IN LATIN AMERICA

BOLIVIA

A gold exploration program was to get under way in May on the Mapiri-Kaka-Guanay Rivers where Bol-Inca Mining Corp. of Nevada has perfected claims to 23,000 acres.

Natomas Co., Sacramento, Calif, gold-dredging firm which owns a two-thirds interest in Bol-Inca, told its stockholders that economic feasibility of a gold dredging project there should be known by end of the year. Natomas would recover its entire investment before earnings are distributed to minority interests.

COLOMBIA

The first export shipment of Colombian lead and zinc was scheduled to leave Buenaventura May 19 for a refinery in California. The metal was mined by the U.S. firm of Latco, Inc.

Latco has a government concession covering 15,000 hectares in the Caldas and Tolima departments of Colombia. A small refining plant, with a capacity of eight tons per day, now is being built in the area.

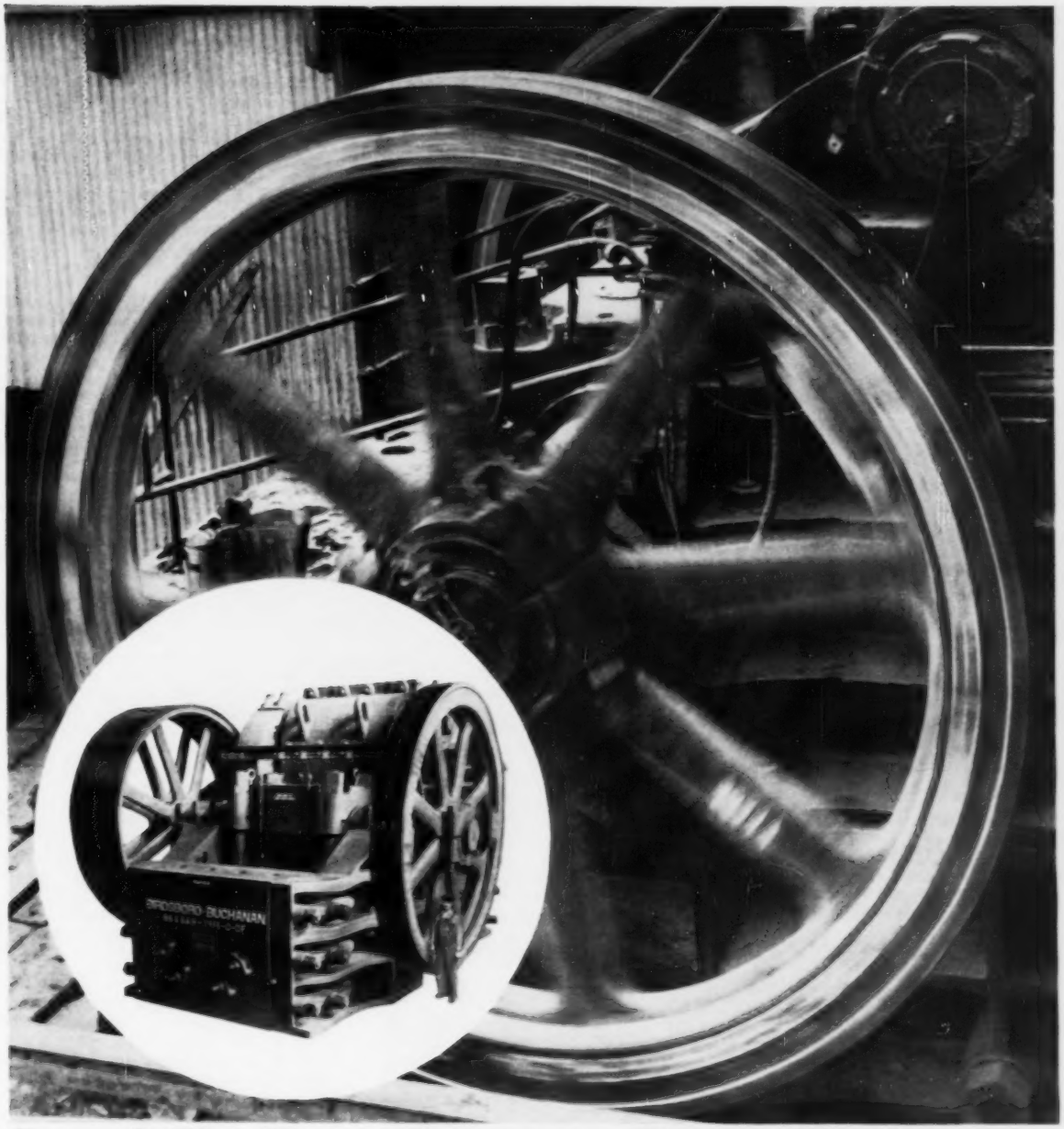
Latco started mining activities in Colombia in the last quarter of 1957 and to date has reportedly invested more than 200,000 pesos ($29,000) in the initial exploitation of lead, zinc and other minerals.

CHILE

Great regret has been expressed in official, copper and social circles in Chile at the sudden and unexpected death of Mr. Roy E. Glover, board chairman of Anaconda Co., as Mr. Glover had given many proofs that he was a true and sincere friend of Chile.

Braden Copper Co. has obtained, for the eleventh consecutive year, first place in the "A" Mine Division (over 5,000 workers) as the mine with the least number of accidents in the annual competition organized by the Interamerican Security Council, New York City. This is a record without precedent and is in great part due to the efficiency and organizing ability of Stanley M. Jarret who has been in charge of this department in Braden for many years.

Cerro de Pasco Mining Co. has con-



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Chile (*Continued*)

tinued drilling the copper property known as Cerro Blanco located in the high Andes near Santiago at an altitude of 11,600 ft. Already more than 80-million tons of sulphide copper ore over 2% copper have been proven.

Cerro de Pasco proposes to build a 28,000 hydroelectric power plant on the Rio Blanco. The company has also been authorized to take 28 gallons of water per second from the river Aconcagua. It also plans to construct a tunnel, six miles long, to reach the orebody without having to cross the high Cordillera (14,000 ft), and a paved road with a maximum grade of 6%.

It has been estimated that $90-million will have to be invested before the mine reaches the production stage. Besides the opening and development of the mine it will be necessary to construct a 10,000 tpd flotation mill, a smelter and a camp for 4,000 people, 2,000 of which will be workers.

The mechanized load wharf for iron ore which is being built at the port of Caldera by the joint efforts of Cía. Minera Santa Fe and Cía. Cerro Imán will be completed in about four months. Its leading capacity is 3,000 tons per hour.

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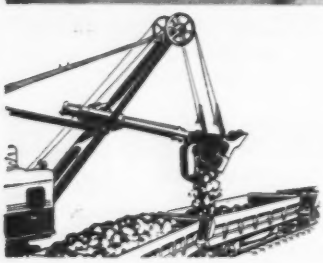

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IN AUSTRALIA

The Australian AEC has approved the construction of a base metal plant at Rum Jungle in the Northern Territory to recover copper concentrate. It will treat copper ores mined in conjunction with uranium ore (and at present stockpiled). Existing copper recovery is from the copper content of uranium ore. The plant will cost about £210,000 and should be in operation before the end of 1958.

Western Australia will impose royalty payments on all minerals and metals produced in that State other than gold, coal and oil. McGraw-Hill World News understands that a flexible policy towards those royalties will be assumed and, as an example, no royalties will be at present imposed on copper and lead because of low prices and marketing difficulties faced by producers.

Two of Australia's largest mining companies have announced substantial increases in production despite the widespread trend to reduce the output of metals.

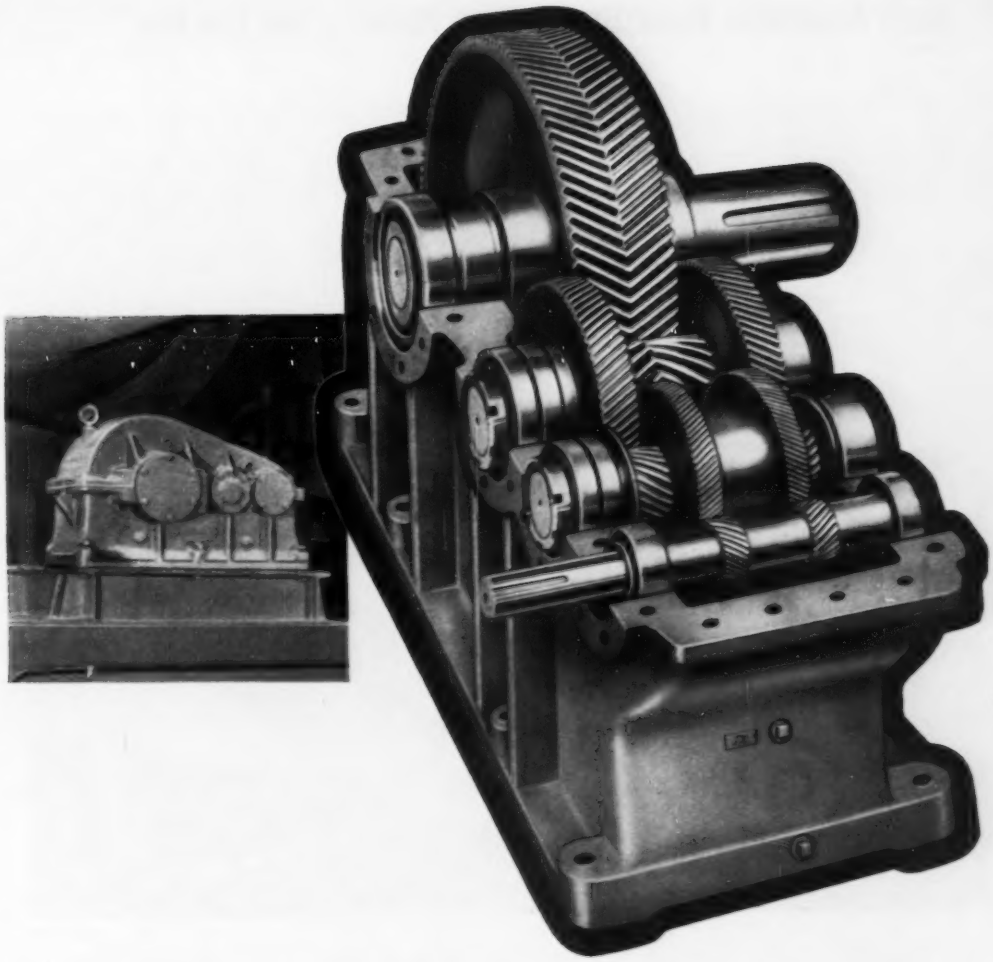
American-controlled Mt. Isa Mines Ltd. has stepped up its daily throughput of silver-lead, zinc and copper ores from 4,000 to 5,300 tpd and its production of lead bullion and zinc concentrates rose by about 30% compared with previous months. This is the first real impact of the company's £45-million expansion program. Mt. Isa's most recent blister copper output figures show an annual rate in excess of 30,000 tons.

In Tasmania, Electrolytic Zinc Co. of Australasia Ltd. has increased the tonnage of ore treated and had a higher output of zinc concentrates and copper from its West Coast Mines. Lead production was running at steady levels. At the Risdon plant the four-week's output of zinc rose from 8,605 tons to 8,663 tons.

Considerable interest is being shown in chrysotile deposits in the northeastern part of New South Wales where a new mill is under construction at Baryulgil. New deposits at Baryulgil and at Barraba are being examined with a view to development. Production of crocidolite in Western Australia is again on increase and exports are increasing, too, with the U. S., Canada, Italy and Japan as main overseas customers.

Canadian interests are behind a plan to establish an ilmenite mining industry on Muriwai Beach, near Auckland, New Zealand. The cost of the project is close to £1-million and an initial order of 1-million long tons spread over five years is discussed. Tests show that the sand contains ilmenite in commercial quantities to a depth of 30 ft, sufficient to allow some 70 years exploitation on the currently envisaged scale.

In the three years during which uranium ore from Radium Hill has been treated at Port Pirie, £17-million worth of uranium oxide has been exported to the U. S. The chief executive officer of



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Australia *(Continued)*

Radium Hill, G. H. P. Jeffery, said that the capital expenditure was now being paid off so that, when the contract to sell uranium oxide to U. S. expired, the mine could be sold on the open market.

Total value of Mary Kathleen Uranium Ltd.'s contract to supply uranium oxide to the U. K. Atomic Authority is about £100-million, and production is expected to begin some months ahead of the stipulated March 1, 1959 deadline.

The contract is for between eight and nine years and annual production is estimated at 500 short tons. No contract price could be disclosed but McGraw-Hill World News understands that a special premium will be paid for uranium oxide delivered in the first few years of the contract.

A mission from the International Bank was to visit Australia at the end of June to examine financing of a scheme to reconstruct a major railroad line to place Australia's lead, zinc and copper surplus on world's markets.

IN THE PHILIPPINES

Marsman & Co., mine managers of Palawan Quicksilver Mines, reported the plant treated 4,844 tons of cinnabar ore in March, recovering 258 flasks of quicksilver, or about four lb per ton. All the major units of the third kiln for the mine's reduction plant have arrived in Manila and will be shipped to Puerta Princesa for immediate installation.

Water shortage for milling purposes continued to hold the milling rate of Atlas Consolidated's Toledo mine to 234,000 tons for March, which resulted in a production of 4,856 tons of concentrates containing 2,777,260 lb Cu, or an average of 0.67% Cu per ton.

According to a compilation of the statistical department of the Manila Stock Exchange, value of the copper output of the Philippines in 1957 surpassed that of all other metals shipped during the year, with gold, chromite, and iron ranking behind copper in that order.

IN ASIA

One of the first official acts of the new Canadian high commissioner to the Federation of Malaya, Arthur Menzies, was to present to the Federation the results of an airborne magnetometer and scintillation counter survey of parts of the country.

Approximately one-third of Malaya—some 16,000 square miles of Kedah, Perak, Selangor, Trengganu, Pahang and Johore were covered by air in the survey. These areas were selected on the basis of lack of present information and the inability of ground survey parties to provide it because of deep tropical weathering of rocks, difficult terrain, lack of access to interesting areas, dense jungle and the guerilla action which began in 1948.

Spartan and Canadian Aero personnel on the project in Malaya were: project manager George Shaw, data technician E. W. York, pilots Ken Fraser and Stuart Hill, navigator Dyson Webb, magnetometer operator Don Davidson, and aircraft engineer Harry Mochulsky, all of Ottawa.

The Quarterly Bulletin of Statistics of the Mining Industry issued by the Department of Mines, Federation of Malaya, notes a reduction of seven dredges; and 143 other tin mining units in operation at the end of previous quarter. The reduction is attributed to Tin Control restrictions.

Production of coal, iron ore and bauxite showed substantial decreases over the previous quarter and in the cases of coal and iron ore, over output for the first quarter of 1957.

A new $3,670,000 ferromanganese plant has gone into production in the Joda valley of Orissa state (east India).

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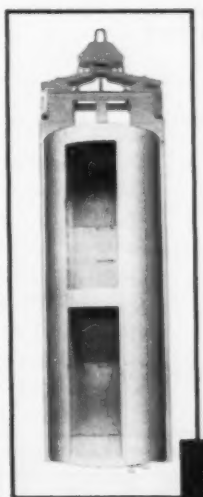

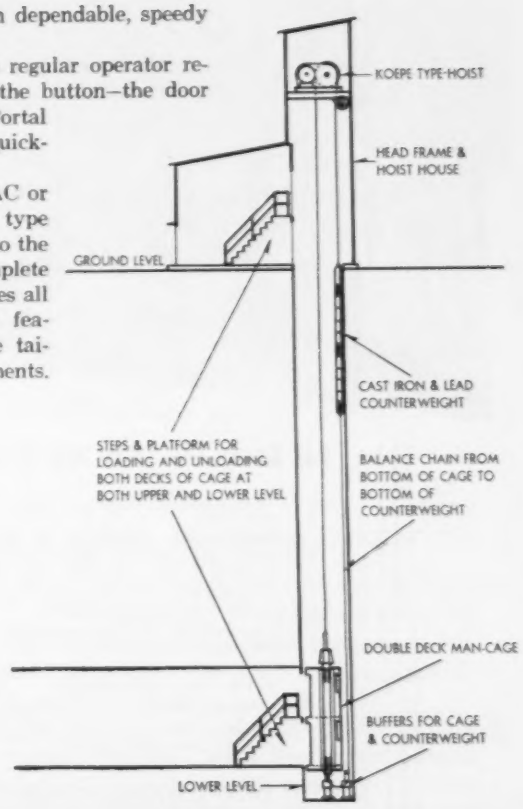
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Asia *(Continued)*

by stages to 100,000 tons—is part of the Tata Iron & Steel Co.'s current $240-million expansion program to raise its steel output to 2-million tons.

India, which previously made its purchases in Europe, will now buy U. S. mining machinery on a scale "never before done," according to Government sources here.

About a tenth of the $225-million of U. S. credit, it is understood here, has been apportioned to cover the foreign exchange requirements of the second Five Year Plan's coal mines development program. This is in addition to a previously made commitment, valued at $15-million.

IN AFRICA

Several trial consignments from the big emerald discoveries made recently in the Belingwe area in the southern part of Southern Rhodesia have been sent to the U. S. for inspection by experts. Preliminary examinations by experts in Rhodesia have suggested that the emeralds may be the finest yet discovered anywhere in the world but a final report is awaited from the U. S.

Unless new sources of payable ore are found, underground operations by Union Tin will cease. Stringent economies are being effected to enable underground operations to continue as long as possible. A limited exploration program will be carried out during the current quarter in the hope of finding additional ore.

Barberton Chrysotile Asbestos—a company in the Eastern Transvaal—reports 33,711 tons milled during the first three months of 1958. Fiber extracted amounted to 1,071 tons (3.177%). Development footage advanced 1450 ft.

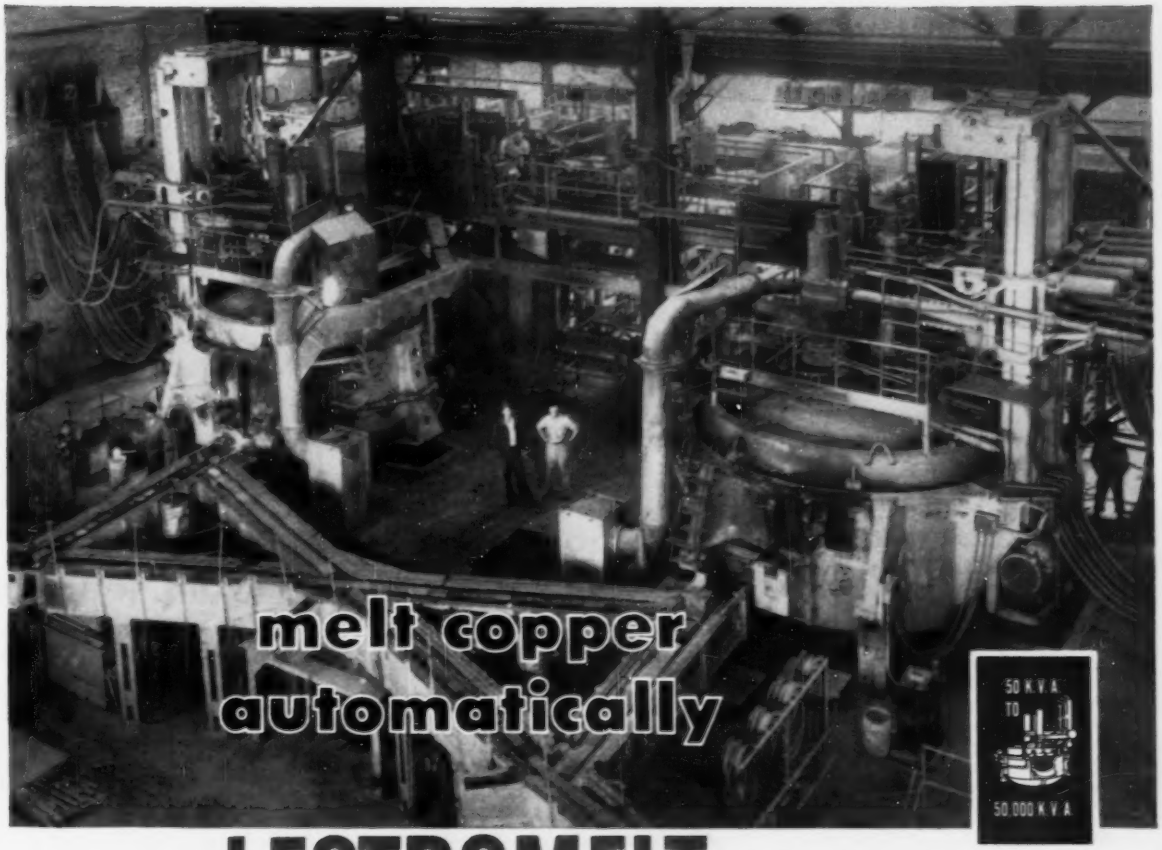
An upper limit of 6,200 tons a year has been put on South Africa's sales of uranium oxide to the Combined Development Agency—the U.S.-U.K. buying organization. This arrangement becomes operative from July 1, 1958. It was announced by Dr. Albertus van Rhijn, Minister of Mines, who is chairman of the Union's Atomic Energy Board.

The decision was taken after talks between the board and representatives of the agency. It means that the agency will not buy the production of mines operating in excess of their plants' capacity, or of extended plants.

It appears that a condition of contract that South African had wanted altered, the freer release of information on uranium production, has not been changed.

The main object of the visit of representatives of the Combined Development Agency was to arrange with the Atomic Energy Board a figure for the output of South Africa in terms of tons of uranium oxide per annum, the official statement said.

The contracts, as they stood, were not specific in regard to quantities. In 1957, the total output sold to the agency was



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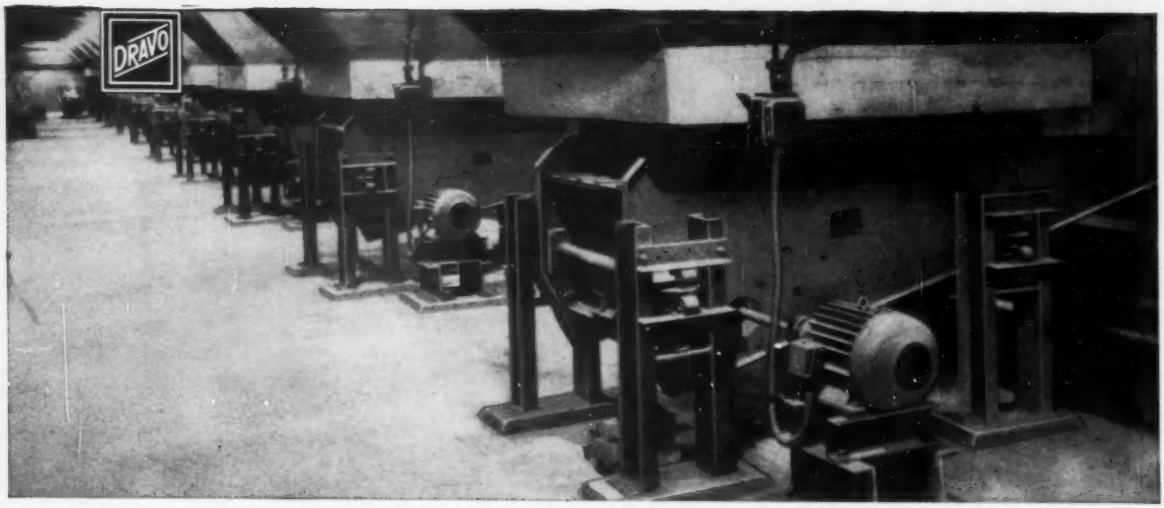

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Africa *(Continued)*

5,709 tons. During the current year, practically all the uranium plants approved by the agency were operating at about, or above, their designed capacity. The figure fixed in terms of the agreement ensured that the mines would continue to operate at about the present rate.

A significant feature of current operations by the South African gold mining companies is the increased production of gold from a lower tonnage milled.

There was a reduction of 624,500 tons milled by member-mines of the Transvaal and OFS Chamber of Mines during the first quarter of 1958 as compared with the first three months of 1957. But gold production increased by 109,140 oz—an increase per ton of 325 dwt from 4.844 dwt to 5.169 dwt.

It would appear that although real working costs have risen during the past 15 months, mining efficiencies and more realistic adjustments between development and production in the newer mines have resulted in the final product being produced a little more cheaply.

New Consolidated Gold Fields, Ltd., technical advisers of the Saaiplaas Gold Mining Co. in the Free State, have made proposals for equipping the mine to permit production to commence in July 1960 at a monthly milling rate of 50,000 tons, increasing to 75,000 tons

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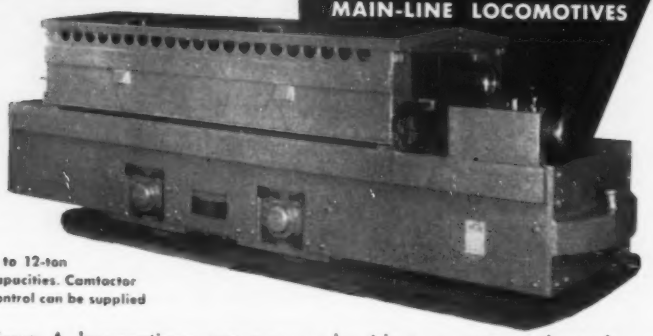

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Africa *(Continued)*

after the first six months and to 100,000 tons after a further year. The date of production visualized in the program is one year earlier than that estimated at the time of the company's formation.

Six leading German industrialists, led by Dr. Konrad Ende, general manager of the State-sponsored Salzgitter industrial and mining group, arrived in Johannesburg during March. The purpose of their visit was to promote the commodities of the group in the Union market and also to study shaft-sinking methods of the South African mines.

There was reason to believe that South African methods in this department of mining were more efficient than any being employed in Europe, said the visitors.

After a visit of three weeks, during which time members of the group had discussions with leaders of mining, industry and with Government officials, Dr. Ende said that the Salzgitter organization would consider building a £1-million ($2.8-million) factory in the Union to produce mining equipment. A decision on the project would be made within six months, he stated.

The annual report of Randfontein mine indicates that the property is developing more and more into a uranium producer rather than a gold producer. According to the directors' report, it is likely that the rate of milling in the gold division will be further reduced during the current year with the continuing exhaustion of the remaining payable ore reserves.

While development footage in the gold section declined from 6,476 ft to 2,459 ft, in the uranium division it increased by nearly 24,800 ft to 122,563 ft. An abnormally high proportion of the uranium division development was carried out in areas not carrying reef values.

Mining of copper ore at the Timna mines in the south of Israel as well as the production of cement-copper has begun in Israel's $10-million copper mine.

The new mine hopes to produce 4,000 tons of cement copper during the first year's operations and later to raise production to 7,000 tons a year.

According to F. Blondel, director, Bureau of Geologic and Mining Study, Paris, France, in a recent issue of *Annales des Mines*, a large mining project is taking shape in Akjoujt, about 530 miles north northeast of Dakar. Site is 155 miles from the sea, and about 124 air miles from Port Etienne, in the Western Sahara.

Preliminary investigations by the Societe des Mines de Cuivre de Mauretanie (Micuma) are practically finished. A plant is being erected to pilot the oxide copper ores. One deposit, Guelb Mohgrein, contains 30-million tons of sulphide ore, 1.5% Cu, and 30 to 35% magnetite. In addition, there is an oxide cap containing 2.5% Cu, and 50% hematite-magnetite. In addition there is one more—an iron deposit of 15-million tons, 52% Fe nearby at Legleitat. A railroad will have to be built to Port Etienne.

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Africa *(Continued)*

With two years of preliminary study behind them, a joint European-U.S. venture on a high-grade iron ore property is about to get underway in French Equatorial Africa.

The project is expected to cost $350-million, including a 460 mile railroad to the sea. Project will be onstream by late 1963-1964 and is expected to deliver 10-million tons per year by 1967. The company is called Societe des Mines de Fer de Mekambo (50% Bethlehem Steel, 34% French, and 16% by steel and mining companies in Italy, Germany, Belgium and the Low Countries.)

IN EUROPE

According to the Polish newspaper *Trybuna Ludk*, the copper smelter which is under construction at Legnica will start production at the end of this year. The copper smelter will have an annual output of 12,500 tons, and will also produce other nonferrous metals, such as zinc, nickel, selenium and silver.

In addition to the smelter, a plant for the production of 20,000 tons of sulphuric acid is being constructed at Legnica.

Snow covering the Val d'Aosta is delaying the inauguration of Societa Cogne's new Costa del Pino magnetite extraction and processing plant at Cogne in the province of Aosta. Societa Cogne belongs to the IRI (Istituto Ricostruzione Industriale) group — almost entirely state-owned.

The mineral will be extracted from a virgin vein at 8,046 ft above sea level. A 2,330 ft slope with an inclination of 34 deg starts from that altitude and is served by a 12-ton payload skip driven by a 600-hp winch and travelling at 16.5 fps.

The ore will be pre-crushed at 6,850 ft. From there it will be railroaded through a 1-mile long tunnel down to the upper terminal of an aerial tramway at 6,760 ft. The tramway will carry the pre-crushed mineral down to Cogne at 5,330 ft for further processing. Carrying capacity of the tramway is 170 metric tons.

In Europe, Coal and Iron Community officials are considering the extreme difficulty in meeting the excessive demands which will be made in the future by blast-furnace operating companies for stocks of all-important metallurgical coke. Crude oil and its derivatives will possibly be tried to fill the gap to prevent a drop in iron and steel production.

In the future, steelmen are planning to produce large quantities of sponge iron in place of the conventional pig iron. This is nothing new in itself, for sponge iron has been used quite extensively in the past for making certain special grades of steel for, from a metallurgical standpoint, it is superior to pig iron in that it is almost, if not quite, free of unwanted gangue material.

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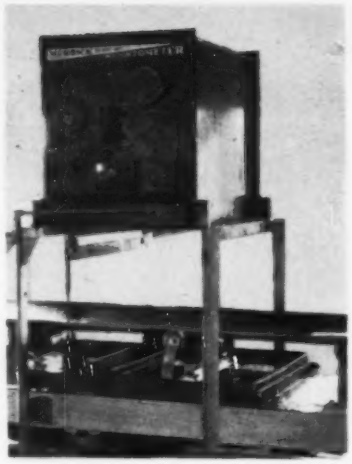

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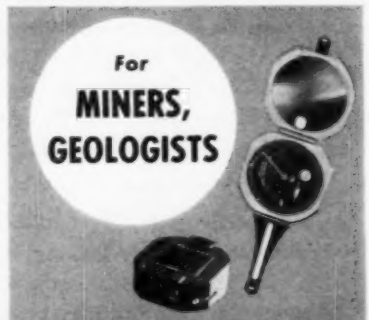

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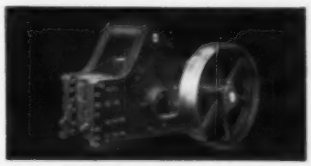
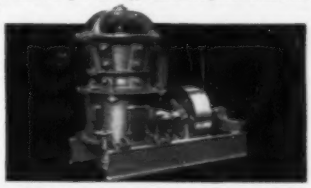
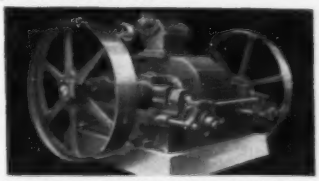


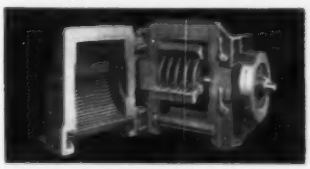
Jaw Crushers — Produce coarse (5 in. largest model) to fine (⅛ in. smallest model). Eight models range from 2 x 6 in. jaw opening (lab model) to 12 x 26 in. Capacities to 30 tph. All except two smallest sizes operate on double cam principle — crush double per energy unit. *Request Bulletin No. 062.*



Rotary Fine Crusher — Reduce soft to medium hard 3 to 8 in. material down to ¼ to 1¼ in. sizes. Capacities up to 30 tph. Smallest model has 6 x 18 in. hopper opening; largest, 10 x 30 in. Non-clogging operation. Single handwheel regulates size. *Request Bulletin No. 063.*



Crushing Rolls — Reduce soft to hard 2 in. and smaller materials to from 12 to 20 mesh with minimum fines. Eight sizes, with rolls from 8 x 5 in. to 38 x 20 in.; rates to 87 tph. Three types — Balanced Rolls; Plain Balanced Rolls; Laboratory Rolls — all may be adjusted in operation. *Request Bulletin No. 065.*



Hammer Mills — Reduce to 20 mesh. Swing-Sledge Mills crush or shred medium hard material up to 70 tph. Hinged-Hammer Pulverizers crush or shred softer material at rates up to 30 tph. Four Swing-Sledge Mills with feed openings from 6 x 5 in. to 20 x 30½ in. Four Hinged-Hammer Pulverizers with feed openings from 12 x 12 in. to 12½ x 24 in. *Request Bulletin No. 084.*

**Reports Manager W. Carleton Merrill concerning Sturtevant Swing-Sledge Mill at James F. Morse Co., Boston.*

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Europe *(Continued)*

lucrative field to the oil industry; despite the dwindling stocks of blast-furnace coke, most countries of the world are aiming at producing more iron and steel in the future. In from four to five years, it is believed in Europe, that U.S. steel plants are expected to be using from 10- to 20-million tons of sponge iron per year; using crude oil as the heat source and as reduction agent, this will give an increased turnover to the American oil industry of from 4- to 5-million tons of crude oil per year.

Pound for pound, less crude oil is required to produce a ton of sponge iron than blast-furnace coke to produce a similar quantity of pig iron. This alone will enable smaller steel plants to produce and process their steel as economically as the most elaborate blast-furnace.

Letters *(Continued from p 91)*

I have read with much interest your recent article entitled "Electrons and Ions." Articles such as this should be an integral part of the library of all those concerned with chemical reactions and the problems of explaining such reactions to others.

M. E. Ostrom
Industrial Minerals Section
State Geological Survey Division
Urbana, Ill.

(Concerning "Electrons and Ions") I have been impressed by the great value that could flow to the mineral industry from the approach . . . selected. You should be congratulated on striking out in this direction in a magazine that so largely covers the mineral industry.

A. M. Gaudin
Department of Metallurgy
Massachusetts Institute of Technology
Cambridge, Mass.

This refers to your "short course in metallurgy" entitled "Electrons and Ions . . . Keys to Mineral Processing" (April 1958). We feel we must object to your thesis that ion exchange is a misleading term and that the four basic reactions, (combination, decomposition, displacement, and double decomposition) used in hydrometallurgical processes are basically ion exchange. There should be no confusion between electron exchange, solid ion exchange and liquid ion exchange.

In ion exchange, whether by solids or liquids, there is no exchange of electrons —no change in the ionic identity. The active polar groups taking part in the reaction are found in either a solid polymer matrix or in an immissible liquid solvent system. On the other hand, electron transfer, such as occurs in oxidation-reduction, electrolysis, or in chemical reduction is distinguished from ion exchange in that the ionic species are changed.

It is not correct to consider processes such as blast furnace operation, lead sulphide roasting and metallic reduction as ion exchange. The definition of ion exchange universally acepted in chemical engineering, chemical industry and other

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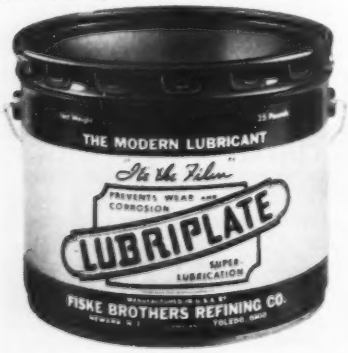

Letters *(Continued)*

phases of chemistry is "a *reversible* interchange of ions between a liquid phase and a solid phase which does not involve any radical change in the solid structure" (H. F. Walton, Journal of the Franklin Institute, Vol. 232, No. 4 (October 1941). The vital aspect of reversibility was first observed in soils by Way in 1850. Obviously, it is the reversible nature of this reaction with a solid electrolyte which distinguishes ion exchange from other unit operations and makes it useful.

A. B. Mindler
Special Applications Department
Permutit Co.

In your February 1958 issue, p 171, the paragraph under "Northern Rhodesia" states: "Chambishi and Baluba mines will be in production by 1960". Sir Ronald Prain made the following references to the mines current position in his 1957 report. . . .

"Chambishi—Last July we received notification from the Chambishi company that up to that point the directors had not been able to arrange such finance on terms which they would consider satisfactory. The same notification detailed the proposed development which, in brief, is that for a cost of £13-million the Chambishi mine could be developed to produce 25,000 tons of copper per annum. The present conditions in the financial markets are such that it is not possible to arrange for the raising of sums of this magnitude on suitable terms, and the development of Chambishi will therefore have to continue to wait for more favorable financial conditions.

"Baluba—There is no intention at present of developing this property, partly because of the continued requirement to delimit the extent of the orebody, partly because is future may be tied up with developments on the neighboring Muliashi property belonging to Roan Antelope, and partly because of the present state of the cobalt market. It will be recollected that so far as is known, Baluba, which is primarily a copper deposi, is also the largest undeveloped cobalt property in the world."

A. J. Wilson
Public Relations Officer
RST Group of Companies
Salisbury, Southern Rhodesia

We notice in (*E&MJ*, March 1958) in a reference to D. F. Ainge on pps 136 and 138 that our Australian subsidiary company is shown as New Consolidated Gold Fields (Asia). Will you please note that the correct designation of the company is New Consolidated Gold Fields (Australasia) Pty. Ltd.

The Secretary
New Consolidated Gold Fields Ltd.
London, England

Correction

In the January 1958 article on the Metal & Thermit plant, the Diagonal Concentrating Tables in the flowsheet should have been attributed to the Deister Concen-Trator Co., of Fort Wayne, Ind.

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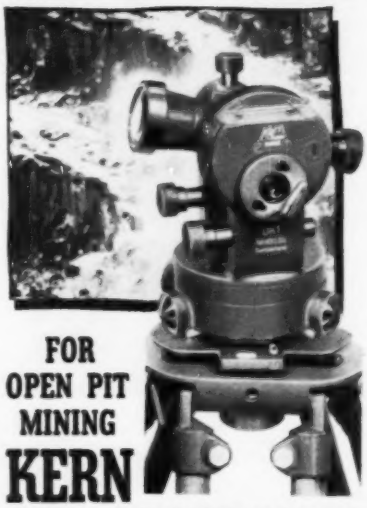

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1—6' x 3' Dorrco Internal Drum Type Filter
2—3' x 4' Oliver Drum Filters
2—4" x 2' Morse Drum Filters
1—4' x 8' Eimco Drum Filter
1—6' x 8' Morse Drum Filter
1—4' x 6' Disc Oliver Filter
2—6' x 2' disc Morse Leaf Filter
1—6' x 5' disc Morse Leaf Filter
1—4' x 2' disc Denver Filter
1—4' x 6' disc Oilver Filter

THICKENERS
1—45' x 12' Dorr Thickener
1—24' x 8' Dorr Thickener
1—22' x 8' Denver Thickener

BELT CONVEYORS
1—14" x 20' Conveyor
1—18" x 41'2" Conveyor
1—17" x 115' Conveyor
1—30" x 135' Conveyor
1—24" x 77' Conveyor
1—20" x 68' Conveyor
1—20" x 136' Conveyor
1—16" x 23' Conveyor

LOCOMOTIVES—DIESEL
1—2-ton Goodman Diesel, 18" ga.
1—4-ton Goodman Diesel, 18" ga.
1—6-ton Mancha Diesel, 24" ga.
1—Ruth Diesel, 24" ga.

LOCOMOTIVES—BATTERY
6—1½-ton Mancha "Little Trammers," 18" ga.
1—1½-ton General Electric Trammer
3—3½-4 ton Mancha Locomotives, Titan "A"
1—4 ton Westinghouse-Baldwin Locomotive
2—6 ton General Electric Locomotives
2—7 ton General Electric Locomotives
1—7 ton Atlas Locomotive
3—8 ton Ironton Locomotives
2—8 ton Goodman Locomotives
2—8 ton General Electric Locomotives
1—9 ton Whitcomb Locomotive
4—10 ton Atlas Locomotives

LOADERS
17—Eimco 12B, 18" ga.
8—Eimco 21, 18" & 24" ga.
3—Gardner-Denver Model 9, 18" ga.
1—Joy HL3, 18" ga.
1—Joy HL20, 24" ga.

AIR SLUSHER HOISTS
4—Ingersoll-Rand Model A5NHOH
1—Joy Model FF211
1—Ingersoll-Rand Model HNN-1J

FANS AND BLOWERS
6—Joy Model 1-21, 5 HP Electric
1—Joy Model 18, 3 HP Electric
2—Coppus Model TM5, 2 HP Electric
2—Coppus Model T5, Air Driven
2—Coppus-Vane, Air Driven

COMPRESSORS
1—1085 CFM, 21" & 12" x 16" Ingersoll-Rand Imperial Compressor with 200-HP Motor
2—759 CFM, 18" & 10" x 14" Ingersoll-Rand Imperial Type 10
1—447 CFM, 14" & 7½" x 12" Ingersoll-Rand Imperial Type 10
1—364 CFM, 10" x 9" Sullivan, Class WG9
1—330 CFM, 11" & 5" x 11" Chicago-Pneumatic, 250# Pressure
1—293 CFM, 12" & 6" x 10" Ingersoll-Rand Imperial
1—285 CFM, 6" & 4¾" x 5" Gardner-Denver
1—198 CFM, 10" & 5¼" x 5" Sullivan Model WL60
1—179 CFM, 12" x 10" Ingersoll-Rand Type NE-1
1—161 CFM, 9¾" & 5½" x 5½" Chicago Pneumatic Type PB2
1—173 CFM, 9" x 8" Chicago Pneumatic Type NSB
1—120 CFM, 8" x 6" Ingersoll-Rand Type ER-1
2— 88 CFM, 7" x 5" Ingersoll-Rand Type ER-1
1— 80 CFM, 6" x 5" Worthington Type HB

PUMPS
1—6" Fairbanks-Morse Pomona, 6-stage Deep Well Pump with 30-HP Motor
1—Byron-Jackson 2" x 3" x 11½", 2-stage Pump with 75-HP Motor
1—Byron-Jackson 3" x 4" x 11½", 2-stage Pump with 125-HP Motor
1—20-HP Fairbanks-Morse Pomona Vertical Turbine Pump
1—1½" Aurora Turbine Pump with 15-HP Motor
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2—Ingersoll-Rand Model 10HR
5—Gardner-Denver Model HK
2—Joy Model F113
3—Ingersoll-Rand Model HU

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1—5-HP Sullivan, Single Drum, Model DE
2—7½-HP Sullivan, Single Drum, Model HE
4—5-HP Sullivan, Double Drum, Model HDE
2—15-HP Ingersoll-Rand Model 15NN-1G
2—20-HP Ingersoll-Rand Model 20NM2C
1—50-HP Sullivan Model CF-211

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1—15-HP Vulcan
1—20-HP HGB
1—25-HP Vulcan #1½
1—30-HP Vulcan #22C
2—40-HP Vulcan
1—50-HP HGB
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1—75-HP Vulcan
2—100-HP W. A. Box
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1—1½" Kimball-Krogh
2—1½" Galigher, Vac-seal
5—2" Wilfley
1—2" Denver
2—2" A.S.H. Hydroseal
3—2" Galigher, Vac-Seal
4—3" Wilfley
1—3" A.S.H. Hydroseal
2—4" Wilfley
2—4" A.S.H. Hydroseal
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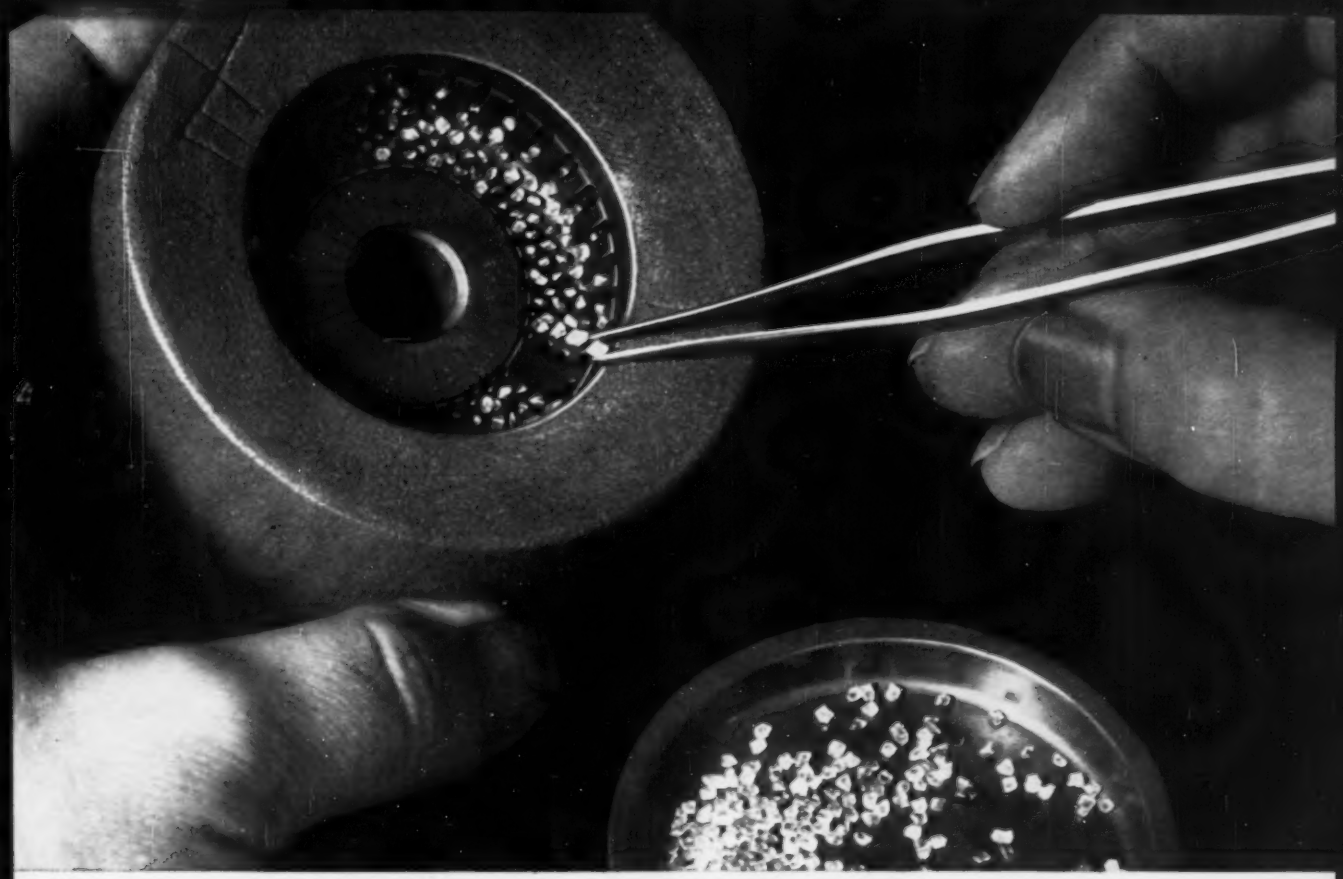

Two-Faced Diamonds help us cut your drilling costs

This diamond business sure is different! Here you see a shot of the operation known as "mechanical setting". Of course, the setter is setting the diamonds *by hand;* they *must* be set by hand because no machine yet devised has the ability to set diamonds with the "best face to the work" that gives you the better cutting power, longer cutting life and greater footage that you want.

Time was when the setter took the actual bit blank, scribed the pattern, drilled an individual hole for each diamond, set the diamond in, tapped it home, peened in the edges of the hole and, although the technique sounds primitive, turned out a pretty good bit. That was "hand setting".

Nowadays, he starts with a beautiful solid carbon mold in which the location of each diamond is a precisely spotted cavity. Into each cavity he sets the selected diamond and he still sets it "best face to the work".

This is called "mechanical setting" because it has the advantage of the precise carbon mold. But, for all this modern mechanization, it still has the all-important advantage of an expert eye and a practiced hand placing each diamond as it *must* be placed for top performance.

The Truco Bits resulting from this combination of mechanization, skill and experience demonstrate their superiority in faster cutting, greater footage, higher salvage, lower diamond cost. Try a Truco and see for yourself.

TRUCO DIAMOND BITS *by*

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue, Detroit 38, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada

MEMBER Diamond Core Drill Manufacturers Association

BUCYRUS-ERIE COMPANY uses 14 Timken bearings at critical points in the crowd, main and swing machinery of the "River Queen" to take radial, thrust loads in all combinations.

Giant shovel swings 80-ton bites 300 ft., stacks 'em 100 ft. high, 14 TIMKEN® bearings take the loads

IT'S a whopper!—this Bucyrus-Erie 1650-B stripping shovel. It weighs in at over 2,400 tons, rises 140 ft. high. Taking 80-ton bites of overburden, it can pile up a "mountain" of 100,000 tons in a 24-hr. period. 15 electric motors power the giant, one of the largest mobile land machines ever built in the U. S. Yet one man in an air-conditioned cab controls the entire digging operation.

To take terrific radial and thrust loads 14 Timken® tapered roller bearings are used at critical points in the crowd, main and swing machinery. Their tapered design enables them to take any combination of radial and thrust loads. The full-line contact between rollers and races gives Timken bearings extra load-carrying capacity, too. And they shrug off shock loads; they're case-carburized to have hard, wear-resistant surfaces and tough, shock-resistant cores.

Timken bearings are geometrically designed to roll true. And they're precision-made to live up to their design. They virtually eliminate friction. And by keeping housings and shafts concentric they make closures more effective. Dirt stays out; lubricant in.

We even make our own electric furnace fine alloy steel, for extra quality control. No other American bearing maker does. For your No. 1 bearing value, specify bearings trade-marked "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN TAPERED ROLLER BEARINGS ROLL THE LOAD

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